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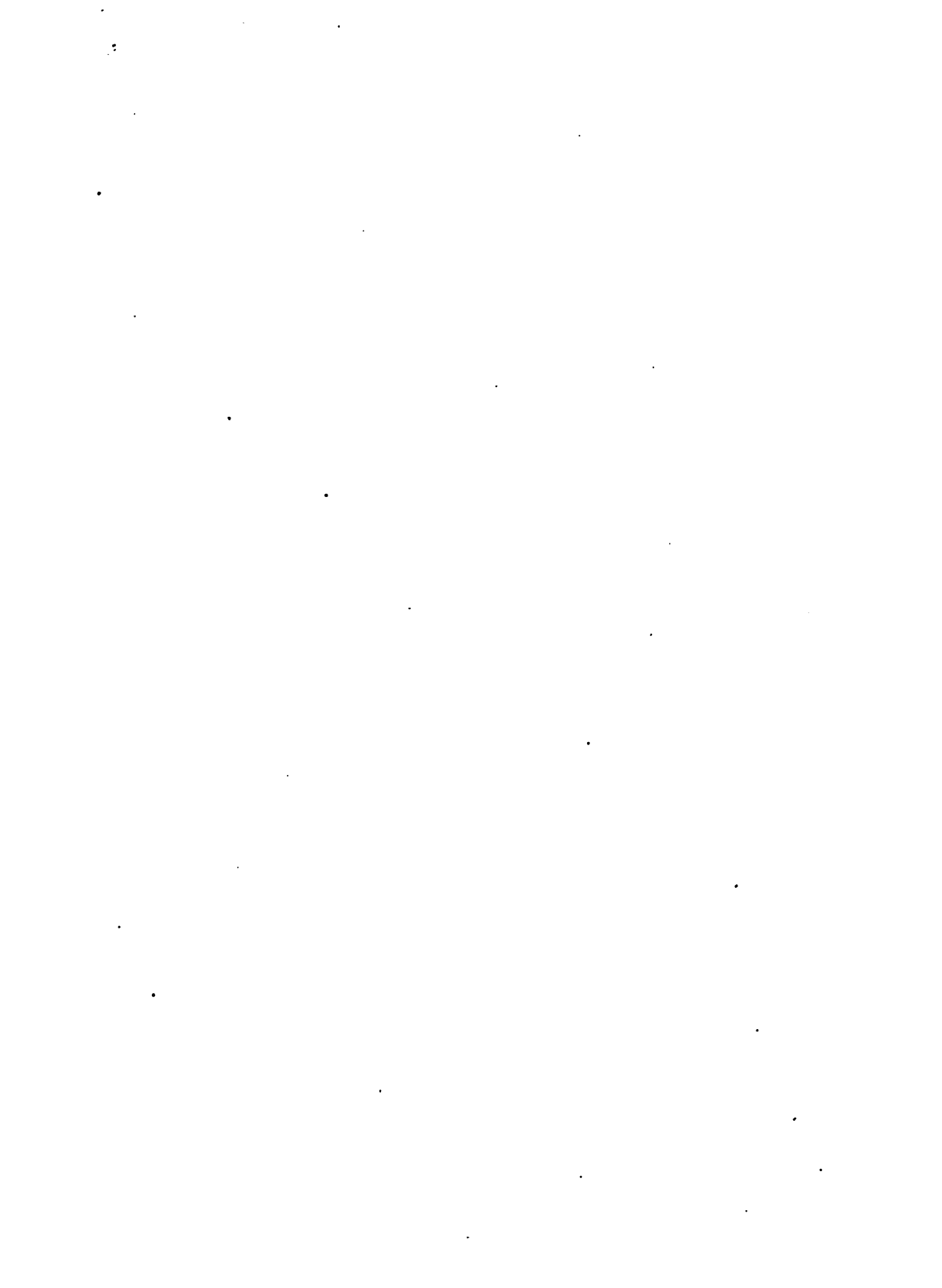
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MEDICINE.



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A HAND-BOOK OF THE THEORY AND PRACTICE OF MEDICINE. By FREDERICK T. ROBERTS, M.D., M.R.C.P., Assistant Professor and Teacher of Clinical Medicine in University College Hospital, Assistant Physician in Brompton Consumptive Hospital, &c., &c.
Second Edition. Octavo.

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The author's style is clear, concise, and methodical. — *Chicago Medical Examiner*.

Dr. Roberts has given us a work of real value, and especially for the use of students is the book a good one. — *Lancet and Observer*.

THE
THEORY AND PRACTICE
OF
MEDICINE.

BY

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MEDICINE, ETC.

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TO

SIR WILLIAM JENNER, BART.,

K.C.B., D.C.L., M.D., F.R.S.,

THIS VOLUME IS DEDICATED,

AS A

TOKEN OF ESTEEM AND ADMIRATION, AND IN GRATEFUL REMEMBRANCE
OF MANY ACTS OF KINDNESS,

BY

THE AUTHOR.

PREFACE TO SECOND EDITION.

THE present edition has been carefully revised, several subjects having been in great part rewritten, in order that they might be brought up as nearly as possible to the existing state of knowledge and observation. While the original plan of the work has been in the main adhered to, it has appeared desirable to make certain alterations in arrangement, and by far the greater part of what was in the former edition in small type has now been printed in the ordinary type. A separate chapter has been introduced on "The Diagnosis of Acute Specific Diseases," while some complaints, which were before but briefly touched upon, have been considered more in detail, and a few of the less common affections are treated of for the first time in this edition.

I desire to thank my friends, Dr. William Squire, Dr. Gowers, and Dr. Mitchell Bruce, for valuable assistance, and my special acknowledgments are again due to Mr. J. Tweedy, who has almost entirely rewritten and considerably extended the chapter on "Diseases of the Skin." To Mr. Arthur Roberts I am indebted for the entire preparation of the Index. I cannot refrain from expressing my gratitude for the numerous kind words of encouragement which have reached me, not only from Students, but also from Teachers and Practitioners; as well as for the suggestions offered, which, so far as was practicable, I have endeavored to carry out.

The success of the first edition of this work leads me to hope that it has fulfilled a useful purpose, and I trust that the present volume may be found equally serviceable, especially to those for whom it is principally intended.

THE AUTHOR.



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THEORY AND PRACTICE OF MEDICINE.

SECTION I.

CHAPTER I.

OBJECTS AND METHODS OF STUDY.

IN order to acquire a satisfactory knowledge of the Science and Art of Medicine, it is essential that the mind should have been previously cultivated and trained, and at the same time stored with the requisite information, by a careful study of the fundamental and more scientific subjects which form the earlier part of the medical curriculum. Above all is it necessary that the student should be thoroughly acquainted with the construction of the human body, and the normal composition, structure, and functions of its various fluids, tissues, and organs in health; in other words, with Anatomy and Physiology. Having this information, he will be very materially aided in his further progress, if, in the first place, he understands definitely what "Medicine" includes, and what he has got to learn; and secondly, if he sets about acquiring the requisite knowledge and skill according to a systematic, orderly, and scientific method.

The subjects which the study of medicine comprehends, may be indicated by giving brief definitions of the more general scientific terms which are employed in connection with it, and pointing out what is included under each.

I. DISEASE.—This term comprises every deviation from the natural condition of the body, or any portion of it, either as regards its structure, state of nutrition, or the due performance of its functions. It will be readily understood that there is no absolute line of demarcation between *health* and *disease*, both being merely relative terms. If a disease is associated with any evident structural change, it is said to be *organic*; if no such change can be detected by any methods with which we are at present acquainted, it is called *functional*.

II. **PATHOLOGY** signifies that branch of medicine which deals with and explains the origin and causes, clinical history, and nature of the different morbid conditions. It is divided into: *a. General pathology*, which treats of what is common to, or bears upon all or a number of diseases; and which comprehends certain very important subjects, such as congestion, hæmorrhage, inflammation, degenerations, etc. *b. Special pathology*, which has to do with the various special and individual diseases. According to the definition of pathology given above, it will be seen that it includes the two following:

III. **ETIOLOGY** or the **CAUSATION OF DISEASE**, which treats of the causes of the various maladies, or the influences and agencies by which they are originated.

IV. **SYMPTOMATOLOGY** or **SEMEIOLOGY**.—These terms comprehend the science which is concerned with whatever pertains to morbid conditions, whether general or local, in their *clinical* relations, *i. e.*, as they are represented in the living subject. It has to do therefore with: *a. Their clinical history*, including *mode of onset* or *invasion*; *symptoms* or *clinical phenomena*; *course, duration, and modes of termination*; *varieties and types*; *complications* and *sequelæ*. *b. Their diagnosis*, which means the recognition of their seat and nature, and their discrimination from other morbid states. *c. Their prognosis*, or the judgment which is formed as to their future course and ultimate issue.

V. **TREATMENT** or **THERAPEUTICS**.—It is only necessary just to mention these here, without any definition, their meaning being sufficiently obvious.

VI. **MORBID** or **PATHOLOGICAL ANATOMY** and **HISTOLOGY**.—The various structural changes which are associated with disease come under this head, as revealed by post-mortem examination.

I proceed now to point out the methods according to which medicine needs to be studied. First, a knowledge of its *theory* should be acquired, as taught in books, lectures, etc., in which such information and explanations are given with reference to principles and facts as can be conveyed in these various ways. Secondly, the *practice* of medicine must be learnt: (i.) By personal observation and examination of actual cases of the several diseases, as exemplified in individual patients. (ii.) By proper attention to the different modes of *clinical instruction*, in connection with which must be mentioned the great advantages to be derived from a thorough training in “*case-taking*,” under competent supervision. (iii.) By the education of those external senses which are being so constantly brought into use in the investigation of diseased conditions, and by repeated practice in the employment of the different instruments which are available for a similar purpose. (iv.) By the observation and study of morbid changes produced in the organs and tissues, as disclosed, by post-mortem examination, the more minute alterations being ascertained by chemical and microscopic research.

All the methods of study just mentioned are important, though of course those of a practical kind are by far the more so, for any one who relies on a mere theoretical knowledge of medicine is absolutely incompetent to enter upon its practice. Still this theoretical knowledge is not to be despised, for it helps materially to clear the way for practical study, saves a great waste of time and labor, and enables the student to comprehend far better what he observes, if he has mastered at least the elements of the subject, and the more information he possesses before beginning his practical work, the more likely is he to derive full benefit therefrom. Before proceeding to study particular diseases, it is very desirable to become well acquainted with the main facts pertaining to those subjects which come under *general pathology*. Then it is essential that every branch of medicine should receive due attention, and that the pathological and clinical relations of different organs and systems to each other should be known. It is a great mistake for the student to confine his observation to any one or more "specialties," even though he may intend ultimately only to practice such; at the same time there are some of the more special departments which at the present day deserve particular attention.

The usual fields for the study of illustrative cases of the several diseases are the wards of a hospital, and the different out-patient departments; each has its advantages and should be duly attended, the former affording illustrations of the acute or more serious chronic affections, the latter of the more common ailments met with in ordinary practice, and of the minor or more localized disorders not usually admitted into hospitals. If practicable, however, it is very desirable that patients should also be visited at their own homes, so that they may be seen surrounded by those conditions which form part of their experience in every-day life. There are certain diseases, too, a practical acquaintance with which is of the greatest consequence, which generally can only be studied in this way, viz.: the majority of the *acute specific diseases*, which, with a few exceptions, are not admitted into general hospitals, on account of their infectious nature, and the opportunity is afforded only to a small number of observing them in the special hospitals set apart for these complaints. Though it is requisite, if possible, that examples of *all* forms of disease should be seen, however rarely they may be met with, yet those which are the more common, and which are likely to come frequently under notice in the course of practice, should receive the chief attention, and of these the student cannot observe too many cases, so as to become familiar with all the chief facts pertaining to them.

CHAPTER II.

ETIOLOGY OR CAUSATION OF DISEASE.

THIS is a subject of the utmost importance, and demands the most attentive consideration, for an acquaintance with the Etiology of disease is of great value in several respects. It often gives material aid in diagnosis; it not uncommonly influences the prognosis considerably, the same morbid condition differing much in its gravity according to its cause; in the majority of individual cases it gives most useful indications as regards treatment; and, above all, it enables the practitioner to take measures to prevent the development or extension of many diseases, and thus to maintain the health of the general community.

A knowledge of Etiology implies not only a general knowledge of the causes which are capable of producing disease, but also a more particular acquaintance with the relation between special causes and special diseases, and, so far as this can be obtained, an intelligent comprehension of the manner in which the various influences produce their injurious effects.

It will be readily understood that the same cause may produce many and very different diseases, and *vice versa*; but with regard to the various classes of disorders, it will be found that each is brought about most commonly by a certain limited number of causes, which act more or less directly on the organ or part affected. This remark may be illustrated by the relation which exists between "taking cold" and lung affections; between improper food or drink and derangements of the alimentary canal; or between excessive mental labor and brain diseases. Further, the particular causes which give rise to special affections of each organ are still more limited in their range. Some diseases can only be originated by one, definite, *specific* cause, and to such the term "specific" is applied.

Numerous terms have been employed to classify causes, often with much ambiguity of meaning. Only those which are practically useful will be alluded to here. The primary division generally made is into *proximate* and *remote*. The *proximate* cause is really the actual morbid condition of any organ or structure upon which the symptoms present depend, and it is synonymous with *pathological* cause. *Remote* causes are further divided into *predisposing* and *exciting*, some of the latter being named *determining*.

Predisposing causes include those influences which bring about a

condition of the system generally, or of some organ or part, rendering it more prone to become the seat of disease. *Exciting* causes comprehend the immediate and direct agencies by which the different morbid changes are produced. The term *predisposition* is used to express the state favorable to the action of an exciting cause, and the individual in whom it exists is said to be *predisposed*. It is not to be supposed, however, that there is a distinct and definite limit between the two classes of causes above mentioned; what may only *predispose* at one time may *excite* at another, and especially is this true when several deleterious influences act together and for a long period. Further, a so-called "predisposing cause" may only render one organ more liable to be attacked than another, as is seen in the influence of age upon the seat of tubercle or cancer.

For the purpose of pointing out the more common causes of disease somewhat in detail, it will be most convenient to classify them into: 1. *Intrinsic*, or those depending upon the individual, in whom they are inherent or acquired. 2. *Extrinsic*, or those due to accidental, and chiefly external influences. So far as this is practicable, an endeavor will be made to point out which predispose to, and which excite disease.

I. INTRINSIC. *a. Age*.—A number of diseases are more prone to occur at certain periods of life than at others; while some tend to affect different organs at different ages, or even special tissues in the same organ. This may be explained often by the nutritive and functional activity of the system generally or of certain organs being much greater at one time of life than at another, and therefore the liability to either general or local disease is more marked. Changes of structure also, in the direction of decay, not unfrequently account for the predisposition due to age, as, for example, degeneration of the vessels in old age rendering them brittle, and thus leading to apoplexy. Young children and persons advanced in years are very subject to ailments of various kinds.

b. Sex.—Females are more prone to certain affections than males, and *vice versa*, while some are necessarily limited to one or other sex. This depends on the different conditions of certain organs in the two classes of persons, and the length of outlets (*e. g.*, the urethra); on the functions peculiar to each sex; on the dissimilarity in habits, occupation, etc.; on the difference in constitutional strength and vigor; or on certain peculiarities in the nervous system, women being much more sensitive and excitable, and therefore more liable to various nervous disorders. The proportion of deaths is greater among males than females.

c. General or Constitutional Condition; State of Health, etc.—A state of debility, whether congenital or acquired, predisposes to many diseases. Possibly the opposite condition of robustness and vigor may increase the liability to others. The condition of the blood has also

much influence, plethoric or anæmic individuals being predisposed to many complaints. Previous diseases, especially of an acute nature, frequently predispose to or excite others, *e. g.*, the various fevers, whooping-cough, lung affections, rheumatism, syphilis, etc. A neglected symptom, such as cough, may be productive of serious mischief. Habitual neglect in attending to certain natural functions, especially those connected with the alimentary canal, very commonly leads to injurious results. The existence of morbid structural changes in organs or tissues may readily induce or predispose to further lesions, or may give rise to diseased conditions in other parts. Thus a fatty or calcified state of the arteries renders them liable to be easily ruptured; cardiac diseases often excite lung affections, and *vice versa*; or one disease of the lung or heart may lead to another. Other causes of disease which may be alluded to here are direct loss of blood; excessive or long-continued discharges; or the sudden suppression of an habitual discharge, of a chronic skin-disease, or of some local development of a constitutional disorder, such as gout.

d. Temperament.—Four principal temperaments are described, viz., the sanguineous, lymphatic, bilious, and nervous, and each is supposed to indicate a susceptibility to certain particular diseases, though the information on this matter is very contradictory. Speaking generally, the *sanguineous* temperament is believed to predispose to fevers of a sthenic type, active congestion or hæmorrhage, and acute inflammations; the *lymphatic* to passive congestions, dropsies, low inflammations, and certain constitutional affections; the *nervous* to various disorders of the nervous system; and the *bilious* to digestive and hepatic derangements.

e. Idiosyncrasy.—Some individuals are affected injuriously by certain things, which do not at all influence others in the same way; this is the case with articles of diet, as fish, mushrooms, etc.; or medicines, such as iodide of potassium, quinine, etc. To this individual peculiarity the term “idiosyncrasy” is applied, and it probably has an influence in predisposing to some diseases.

f. Hereditary Predisposition.—Several diseases are supposed to be capable of transmission from parent to offspring, and with regard to some of them this is unquestionably true, but the evidence is not so clear with respect to others. It must be borne in mind that members of different generations may be exposed to the same extrinsic causes of disease, and this may account for the fact that certain affections seem to run through families. Those maladies or general morbid conditions usually considered to be hereditary are:

- (i.) Certain constitutional or blood diseases, viz., gout, rheumatism, diabetes, scrofula, tuberculosis, cancer, syphilis.
- (ii.) Some affections of the nervous system, viz., epilepsy, chorea, insanity, hypochondriasis, neuralgia, apoplexy, paralysis.

- (iii.) Physical deformities, including deficiencies in connection with the special senses, such as blindness or deafness.
- (iv.) Early degenerations, either local or general, which are evidenced by degeneration of the vessels, fatty changes in organs, loss of the elasticity of the skin, premature grayness or baldness, loss of teeth, etc.
- (v.) Some skin diseases, especially psoriasis and lepra.
- (vi.) Emphysema and asthma (?).
- (vii.) Gravel and urinary calculus.
- (viii.) Hæmorrhoids (?).

The conditions in different generations need not be identical, but may be merely related. This particularly applies to the nervous diseases above mentioned, and to the degenerations. For instance, there may be epilepsy in one generation and insanity in the next. Again, some vicious habit in the parent may lead to disease in the offspring, *e. g.*, intemperance may undoubtedly originate certain nervous disorders. In some cases a constitutional disease in the parent, such as syphilis, may only cause the child to be weakly and delicate.

The transmitted disease may be actually developed in the fœtus in utero, being then congenital; it may only appear at some period or other after birth; or it may lie dormant until brought out by an exciting cause. In some cases it is supposed to pass over one generation and to appear in the next, this being called "Atavism."

Hereditary tendency to disease is unquestionably intensified by intermarriage of those suffering from the same affection, *e. g.*, phthisis; also by the marriage of those who are closely related, very young, or of very unequal ages.

The hereditary character of diseases is sometimes shown in their development at an earlier age than is usual. This is the case with gout and perhaps asthma. Families occasionally seem remarkably prone to be attacked by certain affections, and to have them with great severity, of which the infectious fevers afford illustrations.

g. Race.—There can be no doubt about the influence of race in increasing the liability to certain diseases or *vice versa*. This is exemplified in the greater proneness of white than black people to suffer from malarial fevers. The prevalence of some diseases, however, among particular races may be explained by their habits, mode of living, and place of abode.

II. EXTRINSIC. *a. Causes depending on surrounding meteorological and other conditions.*

(i.) *Atmosphere.*—The air we breathe must necessarily influence greatly the state of health, and it does so in the following ways: It may be impure, because it is not sufficiently changed by proper ventilation, and therefore contains an undue amount of the products of res-

piration, combustion, etc. Or it may be mixed with gases not usually present, such as those which emanate from sewers or decomposing animal or vegetable matters, or those which are given off in different manufactures. Suspended impurities are also often present, *e. g.*, dust, cotton, hair, wool, unconsumed carbon, fragments of metals, arsenic, and, probably, living organisms. The atmosphere is frequently the vehicle for the transmission of specific poisons. The degree of moisture of the air is highly important, excess or deficiency in this respect often producing very injurious consequences. Possibly its electrical condition, or the amount of ozone in it, may have some influence. And, lastly, the degree of pressure of the atmosphere certainly affects the health, of which we have a familiar illustration in the results which sometimes follow the ascent of a high mountain. Atmospheric influences may act either as predisposing or exciting causes.

(ii.) *Temperature*.—Excessive or long-continued heat or cold, whether acting upon the general system, or applied locally, is most injurious. A sudden change from one extreme to the other often causes serious mischief, and so does exposure to cold winds. Even in warm weather a “chill” may give rise to disease, and this is frequently due to the patient’s own neglect, for instance, not being careful to change wet clothes, or being exposed to a draught when heated and perspiring.

(iii.) *Amount of Light and Insolation*.—Those who reside or spend the greater part of their time where little or no sunlight enters, are unquestionably below par as regards health. The amount and kind of artificial light employed has also some influence in the causation of disease.

(iv.) *Soil*.—The chief modes in which the soil exercises its influences are by the amount of vegetable matter which it contains susceptible of decomposition; by its degree of, and permeability to moisture; by its effect on the heat and light of the sun, whether absorptive or reflective; and by its chemical composition, which affects the composition of the water and air in the neighborhood. Wherever there is an accumulation of vegetable substances, with sufficient moisture and a certain temperature, as is the case in marshy districts, malarial affections are almost always prevalent. Clayey soils are very moist and cold. Most sandy and gravelly soils are healthy, unless they contain vegetable matter. Those containing much lime and magnesia are believed to lead to goitre and renal calculus. The breaking up of soil is often attended with evil consequences.

(v.) *Sewage*.—This is a very common source of disease, both on account of the deleterious gases given off from it, and the decomposing organic matter of which it consists. In certain cases it contains specific agents in the production of disease, and promotes their development or renders them more virulent. Sewage materials or the gases

which emanate from them are particularly hurtful in consequence of being mixed with the water which is used for drinking purposes.

b. Causes due to the social condition and habits of the individual, and certain other accidental influences.

(i.) *Food*.—This may be deficient in quantity or of improper quality, either habitually or only temporarily, and may thus promote or induce disease, especially in children. On the other hand it may be excessive or too rich in quality. Irregularity as regards meals, and the habit of bolting food, or insufficient mastication from any cause, are often very injurious.

(ii.) *Drink*.—Intemperance in the use of *alcoholic stimulants* is a fertile source of disease, and it is always well to bear this in mind when investigating any doubtful case. Spirits do most harm, especially if taken at frequent intervals, strong or only slightly diluted, and on an empty stomach. It must be borne in mind also that many of the compounds sold as beer, spirits, etc., contain most noxious adulterations. Water or the want of it is a very prolific source of disease. When insufficiently supplied for purposes of cleanliness, etc., serious results often ensue. The habit of drinking large quantities of water, especially during meals, frequently does harm. Again, water may be the direct means of conveying various morbid agents into the system, such as noxious gases, certain salts, poisonous metals, the ova of worms, animal organic matters, especially those contained in the excretions, vegetable matters in a state of decomposition, and specific poisons. Tea-drinking in excess very often causes ill-health, and its injurious effects are seen daily in all classes of society. Milk does harm if decomposed or adulterated, and it has been proved to be not unfrequently the medium by which specific poisons enter the system.

(iii.) Other *habits*, such as smoking or snuff-taking in excess; the use of narcotics, as opium, etc., or excessive indulgence in hot condiments, are not uncommonly injurious.

(iv.) *Clothing*.—This may be insufficient, either habitually or only from time to time, or certain regions may be inadequately protected. Thus infants and young children are frequently completely exposed about the lower part of the body, and no doubt "take cold" as a consequence. The chest is also in many persons insufficiently covered. On the other hand individuals may be overclad, especially children. Clothing may also do harm by being too tight and exerting pressure, as in the case of tight stays or belts. The custom of not changing clothes when they are wet is very dangerous.

(v.) *Want of cleanliness*, domestic or personal, often induces disease. So does the repeated contact with the skin of various substances of an irritating character.

(vi.) *Amount of Labor and Exercise*.—Many persons suffer as the result of excessive and prolonged labor, whether carried on habitually

or only at intervals. On the contrary, others are injured from leading a sedentary life and taking no exercise. Various occupations furnish instances of both these hygienic errors, though they are often voluntarily indulged in independently of occupation, especially the leading of a sedentary existence.

(vii.) *Mental Causes*.—Among these may be specially mentioned excessive intellectual effort or study, particularly if combined with deficient sleep or much anxiety; and all violent or depressing emotions, such as grief, sudden joy, deep anxiety of mind, or severe and sudden fright. They may either predispose to, or excite diseases, especially those connected with the nervous system.

(viii.) *Mechanical Causes*.—These constitute a very important class, especially in exciting or determining some morbid condition, owing to the direct injury or irritation which they produce. They chiefly include external violence, long-continued pressure, excessive use of a part, over-exertion and straining, prolonged maintenance of a certain position, and the irritation of foreign bodies. Among the last may be particularly mentioned calculi, accumulations of feces, parasitic animals and plants, and substances inhaled in small particles into the respiratory organs. Occupations often act injuriously in some of these ways. A *mechanical* cause sometimes leads to the local development of a constitutional disease; thus pressure or injury is said to determine the formation of cancer in a particular organ.

(ix.) *Causes connected with the Sexual Functions*.—Venereal excesses, masturbation, and too early or frequent sexual excitement, unquestionably often give rise to serious mischief.

The causes which have thus far been considered are usually more or less combined in any individual case. On an extensive scale their influence is seen in the different conditions as to the general state of health, and as to the diseases which prevail in civilized and uncivilized countries; in different nations, and in the same country under varying modifications of government, civilization, religion, etc.; in large towns and country places, as well as in different towns or districts, and in different parts of these; in mountainous regions and low confined valleys. Some of them also explain the influence which *climate* and *season* exert as regards the development of many diseases.

Special Causes of Disease.—There are certain agents which excite disease not yet considered, and which require separate notice. They are chiefly of the nature of poisons of various kinds, and produce effects which are more or less definite and constant.

1. *Chemical Poisonous Substances, chiefly Inorganic*.—The effects of various chemical poisons upon the system are sufficiently obvious, and require no comment. It is necessary, however, to call special attention to the fact, that some of these may gain an entrance into the system in connection with the occupation or in some other way, and

without being directly administered as poisons or medicines. This is seen in the deleterious effects, local or general, which are produced by lead, mercury, phosphorus, arsenic, copper, gold, and other substances. With respect to arsenic, it is important to observe that one of its compounds may be given off as a fine powder from certain green papers used for papering rooms, and be afterwards inhaled along with the atmosphere in which it floats, thus giving rise to symptoms of poisoning.

2. *Causes Originating in the Vegetable Kingdom.*—(i.) Many of the ordinary poisons are derived from this source, such as opium. (ii.) *Parasitic plants* growing in various structures of the body are frequent causes of disease, especially of skin affections. The presence of certain fungi in the stomach is supposed occasionally to give rise to vomiting. (iii.) *Decomposing vegetable matter* often does much harm. It is particularly injurious by producing *malarial or miasmatic poisons* so prevalent in marshy districts. These give rise mainly to certain peculiar fevers, ague, remittent fever, etc., but also to some nervous disorders and other complaints. This subject will be discussed in detail in a later portion of this work. (iv.) It is believed by many that *contagion* is due to low vegetable organisms.

3. *Causes Originating in the Animal Kingdom.*—(i.) Certain animals are venomous and can inflict poisoned wounds, *e. g.*, serpents. (ii.) Some animals are poisonous if taken internally, such as cantharides. (iii.) *Parasites* derived from the animal kingdom very commonly set up morbid conditions. The various intestinal worms, and the external parasites which infest the skin afford illustrations. (iv.) *Specific contagious poisons.*—These will call for special and detailed consideration hereafter. A number of very important diseases originate from the entrance into the system of certain specific poisons, which are transmitted from some other animal to man, or from one human being to another, *e. g.*, hydrophobia, small-pox, scarlatina, syphilis, etc.

4. *Causes Originating within the System.*—Some morbid conditions are due to the presence of a poison in the blood, which has been generated within the body, as the result of the perversion of the functions of digestion, assimilation, and nutrition. Gout furnishes an illustration, and once developed the malady may be hereditarily transmitted.

CHAPTER III.

SYMPTOMATOLOGY OR SEMEIOLOGY.

A "SYMPTOM" may be defined to be anything which in the living subject gives evidence of the existence of some diseased condition. It

is necessary to explain certain terms which are applied to symptoms.

1. *General or Constitutional and Local*.—These imply that the symptoms are referred to the entire system or only to some particular part. 2. *Objective and Subjective*.—The former include all symptoms which are evident to the senses of the observer, *e. g.*, redness or swelling; the latter those which are only felt by the patient, *e. g.*, pain, numbness, etc. 3. *Direct or Idiopathic and Indirect*.—These terms signify respectively, symptoms which are immediately associated with the diseased part; and those connected with some part remote from the seat of mischief, the latter in some cases being called *sympathetic*. Thus vomiting is often present as a “sympathetic symptom” during the passage of a renal calculus. 4. *Premonitory or Precursory*.—Before the actual development of a disease, symptoms may be present indicating more or less clearly what is going to happen, and to these the above terms are applied. 5. *Diagnostic, Prognostic, and Therapeutic*.—These words sufficiently imply that they mean those symptoms which indicate the nature of a disease, its prognosis, or its treatment. *Pathognomonic* is the term applied to such symptoms as belong to one particular disease and no other, which are therefore absolutely characteristic of it. Much confusion has arisen in the use of the word *sign*. Frequently it is employed as synonymous with *symptom*, but this is incorrect, for a *sign* really means a symptom which points to the nature of a disease; in short, it is a *diagnostic or pathognomonic symptom*.

Physical signs strictly speaking include all *objective symptoms*, though only such of these as are elicited by certain methods of *physical examination* are recognized by some as *physical signs*.

In the majority of cases a number of symptoms are grouped together, general and local, subjective and objective, but sometimes one becomes so prominent as to be popularly looked upon as the disease itself, and gives the main indication for treatment, *e. g.*, dropsy or hæmorrhage. Under such circumstances, however, it is imperative that the actual cause of the condition present should be carefully sought for, and the nature of the symptoms often gives a useful hint as to the direction in which this inquiry should be made.

It is very desirable that a knowledge should be acquired of the *clinical phenomena* which pertain to each organ or system, before the study of its individual diseases is entered upon. In the subsequent chapters, therefore, the description of the diseases of the several organs will be preceded by an outline of the symptoms and signs which have to be looked for as evidences of their being in a morbid condition.

MODE OF INVASION OR ONSET, COURSE, AND DURATION OF A DISEASE.—The meaning of these terms is sufficiently obvious. The varieties which are met with in these particulars are as follows: 1. The invasion may be quite *sudden*, as in the case of apoplexy, syncope, many hæmorrhages, etc., the subsequent course necessarily differing in different in-

stances, a rapidly fatal termination being not uncommon. 2. Frequently the illness is *acute*, coming on rapidly, though often preceded by premonitory symptoms; being severe in its character; and of brief duration. Many acute affections run a tolerably definite course ordinarily; for instance, the eruptive fevers or pneumonia; but irregularities are frequently observed, owing to a number of disturbing influences being at work, and in many diseases there are distinct *varieties*. When the onset is less rapid and the symptoms are less severe, the illness is said to be *subacute*. 3. The great majority of cases are *chronic*, the symptoms setting in gradually, not being severe, and the progress being slow and protracted. A chronic disease may, however, be the sequel of an acute attack, or such an attack is often the cause of a fatal termination in chronic cases. 4. Some diseases are characterized by *periodical* exacerbations, which come on at regular or irregular intervals, the patient being comparatively or even quite well in the meantime. Such complaints are chronic in their progress, but acute or sudden as regards the onset and intensity of the attacks, having a remittent or an intermittent course. Epilepsy, ague, and asthma will serve as illustrations.

VARIETIES.—Many diseases are liable to present more or less evident deviations from their ordinary clinical course, and these in some instances are so distinct as to be termed *varieties*.

COMPLICATIONS AND SEQUELÆ.—*Complications* include such morbid conditions as are liable to arise during the course of a particular disease, but which do not usually form part of its clinical history. They may be due to the same cause; or be the direct result of the primary affection; or arise as accidental and independent events. *Sequelæ* are those morbid states which are likely to be left behind, or to be developed subsequent to the apparent cure of various affections. These complications and sequelæ are particularly observed in connection with acute diseases, such as fevers. It is very necessary to be familiar with those which are liable to arise in the several disorders, in order to be prepared for them, and to take measures to prevent their occurrence.

TERMINATIONS.—In a clinical point of view a case may terminate in—
1. *Complete recovery*, which is usually gradual, the patient passing through a period of convalescence of greater or less duration, but may be sudden or very rapid. 2. *Incomplete recovery*, either a condition of impaired general health remaining, or some organ or part being permanently altered in its structure and functions; in fact a more or less *chronic* state of disease remaining behind. 3. *Death*.—This event may take place suddenly, rapidly, or slowly. As a rule it is a complex process, the functions of all the chief vital organs being more or less involved; but often the signs of approaching dissolution are associated more especially either with the *heart*, *respiratory organs*, or *brain*. Death beginning at the heart is said to be by *syncope*, and it may be

due either to a want of a proper supply of blood to the heart (*anæmia*); or to a loss of contractile power in this organ, from mechanical interference with its action, structural changes in its walls, or disturbance in connection with its nerves (*asthenia*). In some instances, such as starvation, these two modes of death are combined. Death commencing at the lungs is said to be by *suffocation* or *asphyxia*. This may depend upon the air inspired being unfit to aerate the blood, or, for various reasons, not entering the lungs in sufficient quantity (*apnœa*); or upon a stoppage of the flow of blood through these organs, as happens when a clot suddenly obstructs the pulmonary artery. Death beginning at the brain is said to be by *coma*, being characterized by a primary state of stupor or insensibility, which, however, is soon followed by interference with the respiratory functions. These various modes of death are merely mentioned at present, as the symptoms which indicate their approach will demand a full description when treating of the diseases of the several organs.

ON THE METHOD AND OBJECTS OF CLINICAL EXAMINATION.

It is extremely important that the practitioner of medicine should be thoroughly conversant with the mode of conducting the clinical examination of patients, and that he should be able to carry this out in an intelligent and systematic manner. In order to acquire this ability, the student should realize that he needs considerable training and practice in "case-taking," a mode of clinical instruction to which he ought to devote his earnest and diligent attention, taking notes of a variety of cases, and writing commentaries upon them. It is very desirable that some definite plan of procedure in the investigation should be adopted and impressed firmly upon the mind, so that it may be followed without effort on the part of the observer. The plans recommended by various writers differ only in minor details, and that of which I now propose to give an outline will answer every necessary purpose. I will endeavor to point out at the same time the object and meaning of the different inquiries which are made, as it is very important to have clear views on this matter.

1. Having noted down the patient's name, age, sex, race (if peculiar), whether married or single, and the date of admission into hospital or when first seen, inquiry should be made with regard to *residence, social position, occupation, habits, and mode of living*, with special reference to *food and drink, clothing, and cleanliness*. Thus information is obtained as to the *general history*.

2. The *family history* should then be taken, in order to ascertain if any hereditary tendency to disease exists. It may be necessary, not only to inquire about particular diseases, but also as to the habitual state of health, the ages when death occurred, and other matters which

an individual case might suggest. Of course it is of primary consequence to investigate with regard to parents, brothers and sisters, and children; but grandparents and collateral relatives, such as uncles, aunts, and cousins, must not be neglected, should there be any reason to believe that there is some hereditary taint.

3. The *previous state of health* of the patient is next to be investigated, and the occurrence of particular diseases noted. Among those maladies which it is particularly necessary to keep in mind are the acute specific fevers, rheumatic fever, pulmonary affections, and syphilis in certain cases. It is always well to ascertain how the chief functions are habitually performed, especially those connected with the digestive organs, and, in females, the menstrual functions.

4. Coming then to the *present illness*, inquiry must be made as to whether it can be traced to any definite cause, and as to its *clinical history*, including its duration, so as to determine whether it is acute or chronic, in the former case it being requisite to ascertain as nearly as possible the exact date of its commencement, its mode of invasion, the chief symptoms complained of, and their progress up to the time at which the patient is seen.

It will be evident that the chief object of the investigation, thus far, is to find out what causes have been influential in bringing about the morbid condition present, whether revealed in the *general history*, *family history*, *previous health*, or in the history of the origin of the *present illness*. No case ought to be looked upon as properly investigated, until every effort has been made to trace the mischief to its source, and, in order to arrive at a satisfactory conclusion on this matter, it will be obvious that it is essential to have as correct and concise a knowledge as possible of the ordinary causes which are likely to give rise to disease of each organ or system, as well as of the relation between particular causes and particular diseases. The degree of difficulty in making out the etiology of a case varies very considerably; in some instances it is evident at once, and one or more causes may be definitely and positively fixed upon; in others very careful and prolonged inquiry has to be made, and then, perhaps, without any substantial result. And here it must be remarked that much caution is often needed in accepting the statements of patients, and this applies especially to the account they give of their habits, family history, and previous illness. Many mislead from ignorance, but it must also not be forgotten that patients who indulge in vicious habits, such as abuse of alcoholic stimulants, or who have suffered from venereal diseases, not unfrequently try to conceal these facts.

Not only is the inquiry up to this point useful in determining the etiology of a case, but further, the information obtained is often of material aid in diagnosis.

5. The next and most important step is to take the *present state*, i. e.,

to submit the patient to a personal examination, and note the existing clinical phenomena. Here again it is necessary to impress upon students the extreme desirability of adopting a systematic course in conducting this examination. This not only materially facilitates the process of arriving at a diagnosis, but, not uncommonly, it is absolutely essential in order to come to a correct conclusion as to the seat and nature of a disease. When learning how to "take cases," it is desirable to go through a tolerably complete investigation of every organ and system of importance in the body, first noting down any *general* symptoms which may be complained of or observed.

The methods by which the required information is obtained are by *intelligent and orderly questioning* of the patient, or of friends or others who are in a position to render it, should the patient be mentally or physically unfit to be interrogated; and by *objective* or *physical examination*. The former reveals *subjective*, the latter *objective* symptoms or *physical signs*. The term *physical examination* is somewhat ambiguously employed; properly it is synonymous with *objective examination*, and should include all modes of investigation in which the external senses of the observer are brought into use; by some however, it is confined to certain special methods, such as those adopted in the exploration of the chest or abdomen. In conducting them most important aid is derived from the employment of various instruments, such as the stethoscope, laryngoscope, ophthalmoscope, thermometer, microscope, etc., and from the use of chemical tests.

It will be at once evident that what is ascertained by *objective examination* is generally far more helpful to the practitioner, and can be much more implicitly relied upon, than what is gathered from the statements of patients or others, and therefore this method ought never to be neglected, if it can be brought to bear in any way upon the investigation of a case. With regard to the *subjective* sensations of patients, although, of course, they should always be taken into account and duly weighed, both for diagnosis and treatment, yet the description of them must be received with a certain degree of caution, otherwise very serious mistakes may be made. They are liable to be exaggerated or misrepresented, and it must not be forgotten also that symptoms may point to one part, when some other is actually the seat of mischief. There is one rule which should be invariably followed by the practitioner, viz.: to test the statements of patients, whenever this is practicable, by *personal* observation, so as to verify them or otherwise, and to see as much as possible for himself. This remark may be illustrated by such symptoms as spitting of blood, vomiting, local redness or swelling, about which patients frequently give very unreliable accounts. The special modes of *physical examination* demand most careful study, as, in a considerable proportion of cases, one or other of them constitutes the only means by which we can possibly arrive at a correct diag-

nosis. In order to carry them out satisfactorily, much *personal* practice is needed, during which the different external senses are trained and educated, and the use of the various instruments is learnt, while at the same time a knowledge is acquired of the nature and meaning of the *physical signs* which are observed or elicited. It must be remarked that in subjecting patients to *physical examination*, regard must always be paid to their condition, for they may be too exhausted or otherwise incapacitated for undergoing it, and might, therefore, be seriously injured if proper care were not exercised.

6. Having thus concluded the clinical examination of a case, and methodically recorded the facts elicited, the student should then *write a commentary* upon it, summing up its leading etiological and clinical features, and giving his views as to its diagnosis, pathology, prognosis, and appropriate treatment. In this way the mind is trained for going through that process of reasoning which is always supposed to be performed when an opinion is being formed on these matters, but which too often receives very inadequate attention, or is even ignored altogether.

7. If possible, it is very useful to watch the case in its further *course* up to its *termination*, noting the progress of the symptoms, as well as any new phenomena which may arise, including *complications* and *sequelæ*. Should the termination be fatal, the *post-mortem examination* ought to be conducted in the same systematic manner as that during life, a record being kept of the condition of the various organs and structures.

Of course it is not to be expected that those engaged in ordinary practice can submit every patient to the complete routine examination just described, nor, indeed, is this required in the majority of cases; much of the general and family history will be known in many instances, and an experienced observer can usually obtain a speedy clue as to the probable seat of disease, and can frame and direct his inquiries accordingly. At the same time every practitioner ought to be thoroughly competent to carry out a full and searching investigation, should this be needed, while it is very important to avoid falling into the habit of conducting it in a careless and superficial manner, and every case should receive as attentive a consideration as its nature seems to demand.

A few concluding hints as to the mode of examining patients when rapidity of diagnosis is desirable, may be of assistance to young practitioners, as well as to advanced students, especially those who may have to undergo examinations in clinical medicine.

1. Whenever a patient is first seen, the observer should always be looking out for anything which may be evident on a superficial and cursory examination. Much information is often thus gained, and important clinical phenomena may be at once noticed, which give most

useful indications as to the seat or nature of the existing disease. The chief matters to which attention is to be directed are as follows: *a.* The *general aspect and condition*. This may reveal, for example, the "typhoid state;" corpulence or emaciation; malnutrition of the muscles; a peculiar temperament; agedness; or striking evidences of some constitutional disease, *e.g.*, cancer or scrofula. *b.* The *posture or gait*, which may indicate great debility or helplessness; prostration; difficulty in breathing; restlessness; or immobility on account of pain, paralysis, etc. *c.* The *countenance*. This deserves careful study, for it often affords most instructive information. Thus we may observe an *abnormal color*, such as the pallor of anæmia, of syncope or shock; the peculiar tint of chlorosis; the malar flush of "hectic fever;" the redness and turgidity of plethora; the dusky or livid hue of some cardiac and pulmonary diseases; the white and pasty appearance characteristic of certain forms of kidney disease; or the yellow color of jaundice. There may also be noticed puffiness, especially about the eyelids; a bloated condition of the face; or enlargement of the small bloodvessels. The *expression* is also frequently very characteristic, indicating, for instance, serious illness, pain, anxiety, or morbid indifference, but especially as pointing to certain forms of insanity and other nervous disorders, such as mania, melancholia, imbecility, epilepsy, hysteria, or delirium tremens. Again, the *features* may give evidence of paralysis; or of muscular twitchings or convulsions, as in chorea or epilepsy; or squinting, or alteration in the size of the pupils may be observed. *d.* The *state of the skin and superficial structures generally*. Here may be noticed an abnormal color; the presence of eruptions; undue dryness or moisture of the skin; excessive or deficient temperature; subcutaneous dropsy, either general or local, etc. *e.* *Symptoms referable to special organs*. In many cases one or more particular symptoms, pointing to a certain organ or system, may be obvious at once. Thus there may be signs of dyspnœa; or phenomena referable to the nervous system, such as delirium, unconsciousness, various forms of spasmodic movements, or paralysis; or vomiting and other symptoms pointing to the stomach. It must not be forgotten that the senses of *smell* and *hearing* may afford assistance in this general examination. For instance, the breath may have some characteristic odor, such as that of alcoholism, uræmia, or gangrene of the lungs; or the attention may be drawn to the larynx or trachea by the sound produced during the act of breathing.

2. Having completed this general survey, the next point is to ascertain how long the patient has been ill, so as to determine whether the malady is acute or chronic. Then inquiry should be made as to the prominent symptoms of which the patient complains, or which have been noted by others, and in the majority of cases the attention will thus be called to some particular region or organ, which is the seat of

mischief. Should this not be sufficiently clear, a few leading questions may be put, so as to try to find out whether the malady seems to be localized anywhere, or if it belongs to the class of general diseases, in the latter case the further investigation being guided by the information obtained.

3. Should the clinical phenomena which are noted seem to point to some local morbid condition, the attention should then be directed first to the organ or part apparently involved, careful and complete inquiry being made with reference to the symptoms and signs known to be associated with it, of course employing "physical examination" whenever this can render any service. Then it must be borne in mind that many of the organs and systems in the body have a material influence upon each other in disease as in health, and therefore it is requisite in the next place to find out the condition of those organs which are most nearly related to that which is found to be primarily affected. After this a few questions may be asked, so as to find out the state of the chief systems in the body, even though no symptoms are complained of having any reference to them. Especially is it useful to pay attention to the digestive, respiratory, and circulatory organs, and, in females to find out whether menstruation is normal. It is a good rule always to look at the tongue; to feel the pulse; to submit the lungs, heart, and vessels at least to a cursory examination; and to *test the urine*, particularly if there is any obscurity about the case under investigation.

The discovery of the seat and nature of the malady from which a patient is suffering often affords most valuable suggestions as to the points to be principally attended to in the history, in order to ascertain the etiological facts bearing upon the case. In this way, not only may the diagnosis be rendered more certain and clear, but most useful indications for treatment are frequently brought to light.

CHAPTER IV.

GENERAL REMARKS ON DIAGNOSIS, PROGNOSIS, AND TREATMENT.

DIAGNOSIS.—It cannot be too often insisted upon, that to endeavor to arrive at a *satisfactory diagnosis* ought to be the first duty of a medical practitioner in every case which is brought under his observation and treatment. Now it is very necessary for those who are studying medicine to understand at the outset what a *satisfactory diagnosis* means. It implies a complete, exact, and comprehensive knowledge of

the case under consideration, as regards the seat, extent, and nature of *all* existing morbid conditions. Of course such a diagnosis is not always attainable, but it is what should be conscientiously aimed at, and, if the observer has acquired the knowledge indicated in the previous chapters, and conducts his investigation with sufficient care and thoroughness, a tolerably correct opinion can generally be formed. It is not an uncommon error to be content with merely ascertaining the chief symptoms present, perhaps giving a name to the group, such as dyspepsia; or to fix upon one prominent symptom, *e. g.*, ascites or jaundice, and call that *the disease*, while no attempt is made to interpret the meaning of the phenomena which are observed, or to find out the pathological conditions upon which they depend. Again, when one or other of the organs is found to be structurally diseased, it often happens that very inadequate attention is paid to the determination of the precise locality, extent, and nature of the existing lesions, while the possibility of other organs being implicated is very liable to be overlooked, and thus the diagnosis is by no means so thorough and exact as it ought to be.

In attempting to form a diagnosis, a process of mental reasoning should be gone through, which needs to be more or less elaborate in different cases, the facts elicited being passed in review, and certain conclusions founded upon them. The questions to be decided may be thus stated:

1. Whether there is anything wrong at all, for it must be borne in mind that not a few complain when there is no actual disease, especially among those who belong to the class of malingerers.
2. Should there be indications that the patient is really ill, it is requisite to determine:
 - a. Whether the ailment is *acute* or *chronic*?
 - b. Does it belong to the class of *general* diseases, and, if so, what is its nature?
 - c. Is the mischief localized in one or more of the organs of the body, or in some particular tissue?
 - d. Should this be the case, is there merely functional disorder, or can any positive organic and structural change be detected?The seat, extent, and nature of all morbid alterations should then be made out as accurately as possible. It must not be forgotten that *local* lesions are frequently found accompanying the so-called *general* diseases, such as the various fevers, and a diagnosis would be anything but complete in such affections, unless every care had been taken to ascertain whether any local mischief existed.

The exact mode of arriving at a diagnosis differs in different cases, while the degree of difficulty experienced in coming to a correct conclusion is necessarily very variable. In some instances we can make a *direct* diagnosis speedily and confidently, some combination of clinical phenomena, or some one or more *pathognomonic* symptoms being presented, which at once reveal the nature of the malady. In others the diagnosis has to be more or less *differential*; diseases which resemble

each other being called up in the mind, and discriminated from each other. This is a less simple and easy process, and a very careful consideration of all the elements which are available for assisting at forming a diagnosis is often required. These elements, when the patient is first seen, are: 1. The account which is given of the *general history*, *family history*, and *previous health*. 2. The history of the *present illness*, as to its duration, probable cause, mode of invasion, and progress. 3. The actual clinical phenomena observed, especially those of an *objective* character. Even after the fullest consideration of all these points, it is sometimes impossible to come to any, or to more than a very doubtful conclusion. Under these circumstances it is exceedingly important not to form a hasty opinion, but to learn to wait and see what assistance the course of events may afford. This rule is especially to be attended to in cases of acute febrile diseases, otherwise very serious mistakes are liable to be made. The further elements in connection with the progress of a case which may aid diagnosis are: 4. Its clinical course, duration, and termination. 5. The phenomena observed on repeated examination under various conditions. 6. The results of treatment. In some obscure cases a diagnosis can only be made by *exclusion*, *i. e.*, by proving the absence of all diseases which might give rise to the symptoms observed, except one, the presence of which is therefore rather a matter of probability, than actually indicated by any positive signs. Occasionally it is quite impossible to come to any conclusion as to the nature of the malady from which a patient may be suffering.

In order to render the process of arriving at a diagnosis more easy and rapid, as well as to insure greater certainty in the opinion formed, the following points are worthy of the attention of students. They should make themselves familiar with the *more characteristic* clinical signs of, at least, the *ordinary* individual diseases, *i. e.*, those symptoms which are diagnostic or pathognomonic. Then it is very useful to be able, speedily and without difficulty, to call up in the memory the complaints which have to be discriminated from each other, in any case which comes under notice. Therefore it is necessary to bear in mind what affections resemble each other; to have the chief diseases of the several organs arranged under the two groups of acute and chronic; and to be well acquainted with the pathological causes to which any very prominent symptom may be due, such as dropsy, jaundice, etc. Lastly, in making a diagnosis it must not be forgotten that irregularities and deviations from the usual clinical course of diseases are often met with in practice; that many affections present distinct and well-marked *varieties*; and that some serious complaints are liable to arise very insidiously, not being attended with any prominent clinical phenomena.

PROGNOSIS.—To “give a prognosis” is often a matter of considerable

difficulty, and in many cases it involves an amount of knowledge and tact which can only be acquired by prolonged experience. Here it is only practicable to give a few general hints bearing upon the subject. In the first place it is requisite to understand what questions have to be determined in forming a prognosis, and to try to realize distinctly which of these apply more particularly to any individual case, before offering an opinion concerning it. These questions have reference to the progress, ultimate issue, and duration of the case, and the following include the most important: 1. Whether the disease is more or less likely or certain to terminate in death or recovery; or to continue for an indefinite period as a permanent and incurable malady, but without causing any danger to life? 2. In case of death, may this event be expected to take place suddenly or slowly, and in what way will it probably be brought about? 3. If the patient recovers, will the cure be complete, or is there a danger of some morbid condition being left behind, either a state of general ill-health or some local organic lesion remaining? 4. What will be the probable duration of the complaint? 5. What events are liable to happen in its course, such as changes in symptoms, development of new symptoms, critical phenomena, the occurrence of complications, etc.? 6. Does its presence render the patient more amenable to other affections; or, on the other hand, does it afford protection against certain maladies? 7. May not slight symptoms observed be but signs and warnings of some more serious mischief which is likely to happen? For example, numbness, tingling, slight local paralysis, and other nervous phenomena may be premonitory of some grave organic lesion in the brain.

Of course it will be impossible to give a reliable prognosis, unless a due knowledge has been acquired of the various points bearing upon it, in connection with each several disease, such as whether it is dangerous to life; its rate of mortality; usual modes of termination; ordinary duration; unfavorable symptoms; complications and sequelæ; how it is influenced by accidental circumstances, whether dependent upon the patient or due to external conditions, etc. It is always important to be cautious in offering any opinion as to prognosis, to give the matter due consideration, and to avoid anything like rashness or thoughtlessness. If there is good reason for coming to a certain and definite conclusion, this ought to be stated confidently, and not with apparent doubt and hesitation. On the other hand, when the prognosis is questionable, it is a great mistake to give a positive opinion, but the state of affairs should be made as clear and explicit as possible to those interested, and the probabilities as to the result of the case pointed out, as well as the dangers which are liable to arise. It is better in doubtful cases to err in the direction of giving too hopeful an opinion rather than the opposite, especially with regard to acute diseases, as this often encourages perseverance in treatment upon which

the issue may materially depend. Particular care is necessary in speaking to patients themselves about prognosis, and it should be a rule to make it appear to them as favorable as possible, due regard being paid to any dangers against which they need to be warned. At the same time the friends should be fully informed as to the exact condition of things in every case in which the prognosis is at all grave. In a hopeless case, should the patient desire a positive opinion, it is the duty of the practitioner to give it.

TREATMENT.—The ultimate and most important object of the study of "Medicine," in a practical point of view, is to learn how to cure, relieve, or prevent the various maladies to which the human system is subject. It needs to be particularly enforced at the present day, that treatment may be made efficacious in accomplishing most beneficial results, if conducted properly and according to true principles. It must further be added, however, that in order to become competent to carry it out satisfactorily, much experience is required, as well as the constant exercise of intelligent and independent observation and thought. There is always a danger of falling into a mere routine treatment of particular diseases; or of relying too implicitly on the experience and teaching of others. These mistakes should be avoided, and each individual case ought to be considered on its own merits, for even the same disease may require very different management under different circumstances, and therefore the practitioner should be able to bring his own knowledge and common sense to bear upon the matter, and to use his discretion in varying the measures employed. Before commencing treatment an endeavor should always be made to realize distinctly what it is intended to accomplish by its aid, and what are the indications afforded as to the measures which are required.

It is requisite to make a few general remarks upon the *objects, indications, and methods* of treatment.

The *objects* which have to be kept in view in treatment may be stated as follows: 1. To *cure* the patient as speedily and completely as possible. This is termed *curative treatment*, but though it is a reality, it is applicable to only a limited number of diseases. 2. To *guide the progress* of a malady towards a favorable termination when this is not directly curable, but must run a certain course, the object being to *avert death* and prevent permanent injury to health. This is termed *expectant treatment*, and may be illustrated by the treatment of most fevers, and it is very important that it should be duly recognized, as a great deal of mischief is often done by meddling interference, and it is far better to let many diseases take their natural course, merely watching their progress and only adopting active measures when circumstances seem to require them. 3. To *prolong life*, and to make the condition of the patient as comfortable as possible, should a fatal termination be inevitable. 4. To remove or relieve *symptoms*. The re-

sult may be merely *palliative*, or sometimes in a sense *curative*. For instance, the removal of ascites and other forms of dropsy may practically cure a patient, in so far that he is able for many years to follow the ordinary avocations of life, although the organic disease upon which the dropsy depends is permanent. It is entirely wrong in principle merely to direct treatment to symptoms, or to attempt to relieve them at the expense of the general disease. At the same time they frequently need particular attention, and in some cases nothing further can be done than to endeavor to mitigate them. 5. To *prevent* diseases. *Preventive or prophylactic treatment* is of the deepest importance. It includes attention to the general health of an individual, so as to obviate any tendency to disease; the prevention of the extension of a disease in the same person or to other individuals, and the guarding against possible complications; the warding off of habitual attacks, such as those of acute dyspepsia, asthma, or epileptic fits; and the rooting out of various maladies, especially of constitutional disorders from the members of a family, and of contagious diseases from the midst of communities. In some instances all that can be done is to warn patients against doing things which may give rise to injurious consequences, and to ward off everything that might be hurtful.

The *indications* for treatment are derived from—1. The nature and seat of the disease. 2. The *causes* which have led to it. 3. The personal conditions and surrounding circumstances of the patient. 4. The *symptoms* present, which may not only call for the adoption of certain measures, but may *contraindicate* a line of treatment which would otherwise be followed. 5. The state of the system generally and of the chief organs of the body. The condition of the lungs, heart, and kidneys, often influences treatment materially, and hence one reason for making it a rule to examine these organs.

It will be found that there are certain indications to be followed in the treatment of affections of each organ or system, common to them all, as, for example, those of the lungs, heart, or digestive organs. These should always be borne in mind, and in the subsequent chapters an endeavor will be made to generalize as much as possible the principles of treatment applicable to the diseases of the several organs.

The *methods* of treatment may be described under the following headings:

1. *Therapeutic*, by which is meant the *administration of medicines*, and there is no question but that by their proper employment much good may be done. There are some drugs which have undoubtedly a *specific curative* action upon certain diseases, and it is to be hoped that, as the result of the investigations which are now being made with regard to the action of medicines, many more *specifics* may be discovered. For the large majority of complaints, however, no curative medicine is known, and it is necessary strongly to warn those entering

upon practice, against believing in the so-called "specifics" for those diseases, such as phthisis, for which, from their very nature, no "specific" can ever be discovered. By using remedies in different doses and in various combinations, according to scientific and rational principles, we can modify materially the course of many affections, as well as exercise an important influence upon symptoms. It must not be forgotten that there are other modes of administering medicines besides by the mouth, especially by subcutaneous injection; by means of baths, inunction, or endermic applications; by enemata; and by inhalations.

2. *Diet and general hygiene.* It is very necessary to bring this fact into special prominence, as it is apt to be frequently forgotten, viz., that *treatment does not consist solely in the administration of medicines.* In not a few cases these are not required at all, or they hold a very secondary place in point of importance, while their beneficial action may be almost invariably assisted more or less, by paying due regard to the measures to be now mentioned. Attention to *diet* is often of the greatest consequence, proper directions being given, not only as to the nature of the food and drink, but also as to its quantity, the intervals at which it should be taken, and other matters which an individual case might suggest. The use of *alcoholic stimulants* always demands the most careful consideration. They ought never to be recommended in an off-hand manner, or unless it is felt that they are really required; while as definite instructions as possible should be given as to the kind and amount which should be taken, and other particulars, especially when it is thought advisable to order spirits. It will often be found necessary to limit the consumption of stimulants, as habitual indulgence in excess is a common cause of ill-health. It is also essential always to keep in mind various matters connected with *general hygiene*, as these frequently need to be looked into, and have an important influence in treatment, such as the place of residence of the patient, with its surrounding conditions; habits of life; occupation; clothing; amount of exercise; change of air and climate, etc. It should be remembered that it is the duty of the practitioner to be prepared, if necessary, and especially in cases of acute febrile diseases, to attend personally to questions connected with diet and hygiene, and to see that his instructions are duly carried out. Thus it is often advisable to examine food, such as beef tea, and see that it is of the proper kind and properly made; also to look to the conditions of the sick-room, especially as to ventilation and cleanliness, temperature, the state of the bed, and the removal of excessive curtains or carpets. If a nurse is needed, he should see that she is competent and reliable, as upon this the ultimate issue of many cases turns.

3. *Local and external applications.* These are often most serviceable in treatment, such as hot fomentations or poultices, cold applications, baths, liniments, ointments, lotions, blisters, sinapisms, plasters,

mechanical appliances, electricity and galvanism, gargles, etc. In this connection may also be mentioned the employment of friction, shampooing, and similar measures, which are sometimes very useful.

4. *Operations* are not uncommonly required even in medical practice, *e. g.*, venesection or the local removal of blood, paracentesis, acupuncture, the use of the aspirateur, tracheotomy, etc. When either of these is clearly indicated, there ought to be no unnecessary delay or hesitation in having recourse to it.

SECTION II.

In the present section it is proposed to consider certain morbid conditions which are included under "general pathology," of which, as already stated, it is most desirable to have a comprehensive knowledge before studying them in connection with special organs or tissues.

CHAPTER I.

HYPERÆMIA OR CONGESTION.

By these terms is meant the presence of an excessive amount of blood in a part. According to its cause and to the vessels in which the accumulation chiefly occurs, the hyperæmia is said to be *active* or *arterial*; *mechanical* or *venous*; *passive* or *capillary*.

I. *ACTIVE OR ARTERIAL—DETERMINATION OF BLOOD.*—In this form the arteries are chiefly implicated, being dilated, while there is an increased influx of blood through them, though usually too much blood passes out of the veins as well, and the circulation is accelerated.

SYMPTOMS AND EFFECTS.—The objective signs of *active congestion* are more or less bright redness, with turgescence and increased temperature. Pulsation in the arteries is increased and may be visible, while secretions are often more profuse or altered in quality. Ultimately the vessels may be so distended as to transude serum, or even to rupture and give rise to hæmorrhage. The subjective sensations are usually those of heat, fulness, and throbbing; the functions of a congested organ are often materially and seriously interfered with, as is seen in the case of the nerve centres or lungs, for example. If the congestion continues for a long period it may lead to permanent hypertrophy or

induration of tissues; the arteries also may become persistently dilated and thickened.

CAUSES.—1. Paralysis of the muscular coat of the arteries is the usual cause of active congestion, in consequence of which they yield to the normal pressure of the blood. It is well known that this coat is under the control of nerve fibres which pass from the spinal cord through the sympathetic, and these exercise an important influence on certain pathological processes, of which active congestion is one. The paralysis may be produced: (a.) By direct injury to the spinal cord in experiments, or as the result of injury or disease. (b.) By injury to the sympathetic trunk, of which the congestion resulting from the pressure of an aneurism upon the sympathetic in the neck is an example. (c.) By reflex irritation through the sensory nerves, such as the congestion following the application of a mustard poultice, heat, or cold, or that ensuing upon the excessive use or increased activity of an organ, such as the eye or mammary gland. Under the same category may be mentioned that which often attends severe neuralgia. Probably many congestions of internal organs are produced in this way, and it is frequently the first step towards inflammation. (d.) By causes acting through the brain, which may be illustrated by emotional blushing and by the effects of some poisons.

2. The rapid withdrawal of external support from arteries may cause them to be dilated and thus lead to congestion. This is seen in the effects of applying a cupping-glass to the surface, by which the pressure of the atmosphere is removed.

3. The internal pressure on the vessels may be increased, either from an augmented force on the part of the heart, which principally affects the structures supplied by the arteries given off from the arch of the aorta; or from some channels being obliterated, the blood having therefore to find its way by those which are pervious, consequently distending them unduly. The best illustration of the latter is the "collateral circulation" which is speedily set up when a main artery is tied, or when it is suddenly blocked up in any way. Internal congestions are also often due to this cause, as when they follow exposure to cold, which leads to contraction of the small vessels of the skin, and thus the blood is, as it were, driven inwards. If the walls of the arteries are weakened from any cause, and are deficient in tone, they are more liable to become enlarged, but this does not appear sufficient in itself to determine active congestion.

II. MECHANICAL OR VENOUS.—Here there is no excess of blood entering a part, but a difficulty is experienced in its passage through the veins, which, therefore, as well as the capillaries, become overfilled with dark blood, moving slowly and languidly. This is a very important form of congestion, and often leads to troublesome symptoms calling for the attention of the physician.

SYMPTOMS AND EFFECTS.—The objective signs, supposing the congestion to be superficial, are redness of a dull, dusky, purplish, or livid hue, with frequently evident distension of the capillaries and veins, the latter being often knotted; increase in bulk of the part affected; and not uncommonly a lowering of temperature. After a time the watery part of the blood transudes, containing some of the solid constituents in solution, and thus “dropsy” is produced, which gives rise to still greater enlargement, with a feeling of softness, and pitting on pressure. In some cases a fibrinous material is exuded, giving to the affected structures a firm and brawny feel, as may be observed after obstruction of the veins of the leg in phlegmasia dolens. When the kidneys are congested, albumen is often present in the urine; while, in connection with mucous surfaces, the same condition leads to a watery flux.

If the congestion is still more intense, the coloring matter of the blood passes out, or the corpuscles migrate through the walls of the vessels into the surrounding tissues, or finally the vessels themselves give way and hemorrhage occurs, as is observed in the case of varicose veins and in the bleeding into the stomach or intestines which follows obstruction of the portal vein. This event is especially apt to happen if the vessels are weakened, and the bleeding may take place into the substance of organs as well as on free surfaces.

Should the congestion be very great, rapidly produced, or long continued, it will lead to serious interference with nutrition, which may end in ulceration or gangrene. Occasionally a “thrombus” is formed in connection with a congested vein, *e. g.*, in the portal vein in cases of cirrhosis of the liver. With regard to organs or tissues, mechanical congestion in time causes them to become enlarged or thickened, while a fibroid material is produced, causing induration, stiffness, and loss of elastic and contractile properties. Changes in color are also not uncommonly noticed, to gray, brown, black, etc., due to alterations in the blood-pigments. Ultimately, organs may become much contracted and diminished in size, being also seriously disorganized as regards their structure.

The subjective symptoms will necessarily vary according to the part affected. Generally there is a sense of weight, or dull, heavy uneasiness, while the functions of the organ or structure involved are impaired to a greater or less degree. External parts which are the seat of venous congestion often feel cold and numb.

CAUSES.—1. Some *mechanical* interference with the circulation of the blood through the veins is the ordinary cause of this form of congestion. This may be seated in the heart, and thus affect the entire systemic or pulmonary circulation, or both, according to the precise locality of the impediment. It may only involve some special vein or system of veins, such as the portal, or those of a limb, the obstruction being localized. The cause of the impediment may be either something within the ves-

sels, such as a thrombus, constriction from morbid changes in their coats, or external pressure upon them, as from a tumor, ligature, contracting lymph, etc.

2. Parts which are dependent are very prone to become congested from the mere influence of *gravitation*, and this is especially apt to occur if the tissues are relaxed and yielding, or the *vis a tergo* is deficient. Illustrations of this mode of origin are presented in the congestion of the veins of the legs which follows long standing; and in the formation of hæmorrhoids as the results of sedentary occupations.

3. A diminution of the *vis a tergo* often gives rise to this form of hyperæmia, or assists other agencies in its production. The heart may be weakened in its action, or the arteries have lost their elasticity and contractility, owing to degeneration, and thus the forces which carry on the circulation are impaired, so that the blood cannot be driven through the veins. This is especially observed in old people.

III. PASSIVE OR CAPILLARY.—Many include “passive” under mechanical congestions, but there is a distinction between them, though they are often associated. The capillaries are mainly involved, and the circulation is very languid in these vessels, owing to a disturbance of the vital and nutritive relations between the elementary tissues and the blood. The conditions of a part thus congested are very similar to those observed in mechanical congestion. Atrophy of, and degenerative changes in the tissues are liable to occur, while they become prone to low and asthenic forms of inflammation, tending to assume a chronic character.

CAUSES.—1. A generally weak state of the system induces passive congestion, owing to the feeble activity of the circulation, and to the deficient nutrition and want of tone in the tissues. It especially affects parts which are dependent, or which are distant from the heart. Thus we see coldness and blueness of the extremities, nose, and ears, under these circumstances. Also the hypostatic congestions, which are met with in various low fevers and debilitating diseases, come partly under this category.

2. Morbid conditions of the blood may cause passive hyperæmia. That which is present when the blood is improperly aerated is considered by some to be of this nature, and deficiency of fibrin also favors its occurrence.

3. If an organ or part is locally debilitated from any cause, and the functions of its tissues impaired, it is prone to become the seat of congestion. As illustrations of this may be mentioned, the congestion which is observed often in paralyzed limbs, and that which follows excessive functional activity of an organ, whereby it has become exhausted. It also may succeed active congestion or inflammation, owing to the perverted relations thus set up between the blood and the tissues, as is frequently observed after tonsillitis.

POST-MORTEM APPEARANCES.—Redness, varying in its tint and form according to its nature, is the essential character of all forms of congestion. In *active* congestion the color is bright-red, and is usually in the form of a minute network, or it may appear uniform or in points when certain special structures are involved. It must be borne in mind, however, that there may have been active hyperæmia and yet no redness be apparent after death, owing to the arteries having contracted and expelled the blood into the veins. Points of redness are sometimes seen due to minute extravasations of blood.

The color of *venous* congestion is generally more or less dark-red, but may be blue or purple or livid, while the veins are seen distended and forming a network.

Organs are often said to be congested in post-mortem descriptions, when this has not been the case in reality during life, simply because the blood has gravitated after death into dependent parts, and has thus given rise to this appearance. Tissues also are subject to post-mortem staining by the coloring matter of the blood, which may simulate congestion. The results of congestion already described may be evident after death, such as dropsy, etc., and if it has been long-continued, considerable changes in the physical characters and structure of organs may be observed.

CHAPTER II.

DROPSY—HYDROPS.

DROPSY is only a symptom, though often a very important one, of some general or local morbid condition. It consists in an accumulation of fluid which has escaped from the bloodvessels, either in the subcutaneous cellular tissue, in serous cavities, in the cellular tissue of certain organs, or in all these parts at the same time. Terms are used to express the site of the dropsy as follows: Dropsy of the subcutaneous cellular tissue, if more or less general, is named *anasarca*; if localized, *œdema*; *hydrothorax* signifies accumulation in the pleuræ; *hydropericardium* in the pericardium; *ascites* in the peritoneum; *hydrocephalus* in the ventricles of the brain or arachnoid cavity; *œdema* is the term applied to the dropsy of organs, *e.g.*, œdema of the lungs. If there is dropsy both of the cellular tissue and serous cavities, it is said to be *general*.

It is necessary just to mention certain morbid conditions, which are known as “spurious dropsies,” but which really have no pathological relation to dropsy. They include ovarian dropsy, which is a cystic dis-

ease of the ovary; accumulations of fluid in the interior of hollow organs, as the result of obstruction at an orifice or inflammation, such as dropsy of the uterus (hydrometria), or of the gall-bladder; certain serous effusions consequent upon inflammation, *e.g.*, hydrocele, and acute œdema of the glottis; dropsy of the kidney (hydronephrosis), which is either due to cystic disease, or, more frequently, to obstruction of the ureter, and consequent accumulation of urine and products of inflammation within the pelvis of the kidney, which gradually destroy this organ.

CHARACTERS OF DROPSICAL FLUID.—This is almost always thin and watery; either quite colorless or light yellow as a rule, but sometimes tinged by the coloring matter of the blood or bile; clear and transparent, or rarely opalescent; usually varying in its specific gravity from 1008 to 1012 or 1014. Its reaction is generally alkaline, but occasionally neutral or slightly acid. Chemically it is allied to the serum of the blood, consisting of water holding in solution albumen, alkaline and earthy salts, especially chlorides and extractive matters; but the proportion of these varies much in different parts and in different cases, especially the amount of albumen, and the composition is never identical with that of blood-serum, the proportion of solids being much less. Fat, especially cholesterin, fibrin, or pigments, are sometimes present, and urea in one special form, *viz.*, in renal dropsy.

PATHOLOGICAL CONDITIONS CAUSING DROPSY.—A dropsical accumulation is either the result of excessive flow of fluid out of the vessels, of deficient absorption, or of both combined; in short, the balance between exhalation and absorption is in some way disturbed. This may be due to the following pathological conditions:

1. Over-distension of the vessels in the different forms of congestion, but especially that dependent upon mechanical interference with the return of blood by the veins, is one of the most common causes of dropsy, which is then due both to an excessive escape of fluid from the vessels and to their diminished power of absorption. Obstruction to the circulation on the right side of the heart thus causes more or less general dropsy, beginning in the feet and ankles and extending upwards, and this may also be due to serious impediment in the lungs. Obstruction on the left side of the heart will lead to œdema of the lungs, because the pulmonary vessels are distended. Any local obstacle will cause limited dropsy. Thus interference with the circulation through the portal vein or its ramifications is followed by ascites; a clot in a vein of the arm or leg, or external pressure upon it, will give rise to œdema of the extremity affected. Hydrocephalic accumulation is chiefly the result of pressure upon the small veins returning the blood from the ventricles of the brain. Gravitation necessarily influences much the seat of this form of dropsy, and may itself induce it under certain

conditions. Active congestion does not give rise to much dropsy as a rule, but it often causes local œdema.

2. A feeble and relaxed state of the vessels and tissues, in consequence of which the former readily yield and allow transudation of fluid, often aids in the production of dropsy. The œdema of the feet and ankles which is met with in many cases of general debility is partly due to this cause, being assisted by the weakened cardiac action, which induces mechanical congestion.

3. An unhealthy condition of the blood may occasion dropsy, especially if this fluid is very watery, deficient in albumen, or contains certain morbid materials, such as urea. Under these circumstances its liquid portion readily transudes. This cause often aids materially in the production of all kinds of dropsy, but it is the main influence in the causation of that attending anæmia, and is not unimportant in renal dropsy.

4. It is supposed by some authorities that dropsy depends chiefly on a withdrawal of the nervous influence in connection with the vessels, and experiments have been made to prove that so long as the nerves are intact dropsy will not occur, even if the veins are over-distended. There can be no question that the nervous system does exercise considerable control over the processes of exhalation and absorption, and will thus influence the occurrence of dropsy, but there is not sufficient reason to believe that it occupies the important position attributed to it by some pathologists as a cause of this symptom. Œdema is not uncommonly observed in paralyzed limbs.

5. A deficient power of absorption on the part of the lymphatics has been considered to assist in giving rise to dropsy in some instances. Possibly this may exercise some influence in many cases of cardiac dropsy, the chief lymph ducts being unable to empty themselves into the distended veins.

CAUSES.—Such being the pathological conditions with which dropsy may be associated, and which are often more or less combined, its *causes* may be summed up as follows:

1. *Any cardiac disease that interferes with the circulation of the blood, and leads to overloading of the veins and capillaries.* The most important are affections of some of the orifices and valves; dilatation of the heart; and degeneration of its walls, with consequent weak action. The heart may be pressed upon from the outside.

2. *Affections of the lungs impeding the circulation.* When an acute attack of bronchitis sets in in a case of extensive emphysema, considerable dropsy may follow.

3. *Diseases of the kidney attended with deficient elimination of water and urea, but allowing the escape of albumen in the urine.* As a consequence the blood is impoverished and impure, and the vessels are over-distended. It is requisite to make special mention of *scarlatina*

as a cause of dropsy, which then generally depends upon an acute renal complication.

4. *Diseases of the liver or any other morbid condition causing obstruction to the portal circulation.* This is entirely a local variety of dropsy, resulting from mechanical congestion.

5. *Exposure to cold and wet, or anything producing a chill.* This is generally supposed to act by driving the blood inwards, and inducing active congestion, the resulting dropsy being named *active* or *febrile*. This cause chiefly acts, however, by checking elimination by the skin, and at the same time giving rise to congestion of the kidneys, which therefore cannot perform their functions properly; thus the vessels become overloaded, and the fluid portion of the blood transudes.

6. *Any local obstacle in connection with a special vein.* From this cause dropsy often results from the pressure of a pregnant uterus, ovarian and other tumors, aneurisms, etc., as well as from inflammation of veins, varicose veins, and thrombosis.

7. *Gravitation of the blood into dependent parts.* Long standing may alone lead to dropsy, especially if the blood is watery and the tissues wanting in tone.

8. *Anything that impoverishes the blood.* In this way dropsy may be due to a want of proper diet, especially if combined with other unfavorable hygienic conditions; hæmorrhage or excessive discharges, either natural or morbid; various acute or chronic diseases, such as fevers, especially malarial, phthisis, cancer, splenic disease, scurvy, purpura, etc.

9. *Certain conditions leading to active congestion.* Dropsy occasionally follows the sudden disappearance of chronic skin diseases, or the suppression of discharges, and is then believed to result from active congestion. This may also be due to the irritation of some morbid deposit, such as tubercle or cancer; and it accounts for the œdema often observed in the neighborhood of inflamed parts.

SYMPTOMS AND COURSE.—As a rule dropsy comes on more or less gradually, but sometimes its course is extremely rapid, and it may extend over the whole body in a few hours. It usually first appears and is most abundant in dependent parts, especially such as are distant from the heart; in those which are exposed; or where there is much loose cellular tissue. It is liable to vary with position, being necessarily influenced by gravitation.

The appearances produced by anasarca or œdema are swelling, with pitting on pressure, the skin being generally pale but sometimes congested. The degree of enlargement varies much; it may be so great as to cause the skin to assume a tense, shining aspect, or even to burst or slough. The vitality of dropsical tissues is impaired, and hence they are very liable to low inflammation from slight irritation. When fluid accumulates within serous cavities, it may or may not produce

evident enlargement, but its presence can be made out in most cases by certain "physical signs" to be hereafter described. The subjective symptoms accompanying dropsy of external parts are more or less discomfort and uneasiness, with a feeling of tightness or stiffness, but no actual pain or tenderness. An accumulation of dropsical fluid interferes mechanically with organs, and thus may cause most serious disturbance of their functions. In certain parts it may lead to a rapidly fatal issue, as, for instance, in the case of œdema of the glottis.

The general symptoms will necessarily vary according to the cause of the dropsy. If it is at all considerable in amount, the normal secretions are as a rule deficient in quantity.

DIAGNOSIS.—It is usually not difficult to determine whether dropsy is present, but the chief point in diagnosis is to make out its cause. In order to ascertain this of course it is necessary to observe what other symptoms are present, both local and general, and to examine carefully those organs diseases of which are known to occasion dropsy. Much help may, however, be derived from a consideration of certain facts with regard to this symptom itself, as follows:

1. *Its Place of Origin, Seat, and Extent.*—*Cardiac or pulmonary* dropsy begins in both feet and ankles and extends upwards, ultimately becoming more or less general. Ascites only follows after the circulation through the liver has been for some time obstructed. *Renal* dropsy frequently starts in the face and upper part of the body, especially about the eyelids where there is much loose cellular tissue, and in the hands because they are exposed. It may speedily spread all over the body, and involve all the serous cavities, though not usually to a great extent. *Hepatic* dropsy is confined to the peritoneal cavity at first, because the portal system of veins is alone interfered with. The abdomen may become considerably distended, without there being any dropsy elsewhere, but in most cases after awhile anasarca of the legs sets in, in consequence of pressure exercised by the fluid upon the vena cava inferior. Anasarca of the legs and ascites may appear simultaneously, should there be any pressure on the vena cava just before it passes through the diaphragm. *Anæmia* never causes much dropsy; it is always limited to the subcutaneous tissues; and is usually only seen about the feet and ankles, or in the loose tissue of the eyelids. *Local* dropsy, as, for instance, when it is limited to one leg or arm, always indicates some local cause. Rarely the *superior cava* is pressed upon, and dropsy of the upper part of the body is the consequence.

2. *Its Rate and Mode of Progress.*—*Cardiac* dropsy is generally slow and gradual in its progress, liable for a time to some variation according to position, but ultimately this does not influence it much. It may increase rather quickly from some acute complication in connection with the lungs. *Renal* dropsy, if acute, may be extremely rapid in its course, in some cases producing enormous enlargement of the body

generally, and obliterating the features in a few hours. This is the only form of dropsy in which such a mode of progress is observed; it may also disappear in the same rapid manner. *Hepatic* dropsy usually progresses slowly and steadily. That of *anæmia* comes and goes easily, being often present about the feet in the evenings, but disappearing with a night's rest, while the eyelids are puffy in the mornings.

3. *The effect of pressure* is said to distinguish between *cardiac* and *renal* dropsy, but this is a very unreliable sign. The latter is stated to pit much less and to retain the impression longer, elasticity not being quite lost.

4. *The appearance* of a dropsical part may indicate its cause. Thus in some cases of *renal* disease the skin presents a very peculiar dull-white, pasty aspect. In *cardiac* dropsy signs of venous congestion are often present, the skin being shining and tense.

5. *Characters of the Fluid*.—That of *renal* dropsy is of a very low specific gravity, containing only a small quantity of albumen, and *urea* can in some instances be detected in it.

6. *The Effects of Treatment*.—The dropsy of *anæmia* is easily got rid of; the *renal* form can frequently be removed for a time by appropriate treatment; it is difficult to bring about absorption of *cardiac* dropsy as a rule, if it is at all considerable in amount, and it is liable to return speedily.

TREATMENT.—The objects to be kept in view in the treatment of dropsy are: 1. Its removal. 2. The prevention of its recurrence. 3. The prevention as far as possible of its injurious effects, if the fluid cannot be removed. The particulars of treatment must necessarily be governed by the cause of the dropsy and the organ which is affected, but there are certain general principles which need attention, of which an outline will now be given, as well as of the manner in which they are to be carried out.

1. *Removal of the Cause*.—As illustrations may be mentioned the relief of any pressure or constriction affecting a vein, or of an attack of acute bronchitis in cases of cardiac disease, which may temporarily aggravate considerably dropsy due to this cause. Of course it is highly important to attend specially to any organ, a morbid condition of which is keeping up dropsy, and to try to cure this, or at all events to render the organ capable of performing its functions, so far as this is possible.

2. *Attention to Rest, Position, and Regulated Pressure*.—Far too little heed is usually given to the question of *rest* and *position* in the treatment of dropsy. The part affected should, if necessary, be maintained continuously and for a long time in an elevated posture. Much benefit may often be obtained by keeping the legs, if the seat of anasarca, on a level higher than the body; or by raising an œdematous scrotum by means of a pillow of cotton-wool underneath. *Pressure* is also very valuable in many cases, if carefully and properly applied.

3. *Promotion of Absorption of the Fluid.*—This indication is carried out by employing diaphoretics, saline and watery purgatives, or diuretics, so as to promote free secretion by the skin, intestines, or kidneys, and thus remove some of the watery portion of the blood.

The only *diaphoretic* that is of much practical value is some form of bath which promotes perspiration, such as the warm, vapor, hot-air, or Turkish bath. Either of these may be used as frequently as circumstances require; and local baths may be employed with much advantage if the patient cannot sustain general baths. It is in the treatment of renal dropsy that they are most valuable, and especially of acute cases. An occasional bath is also useful in preventing this form of dropsy. Other diaphoretics are recommended, such as ipecacuanha, antimony, spirits of nitre, liquor ammoniæ acetatis, or citrate of potash; but these medicines are of little or no service for this purpose in cases of dropsy.

Watery purgatives are frequently most efficient in relieving dropsy, but care must of course be exercised in their administration, as they tend to weaken a patient. The most important are extract of elaterium (gr. $\frac{1}{6}$ gradually increased to gr. $\frac{1}{2}$); jalap (ʒj to ʒij); and cream of tartar (ʒj to ʒij); the last two form a very effective combination. They may be given two or three times a week, or oftener if required. Other purgatives are employed, such as gamboge, veratrum, podophyllin, calomel, or croton oil; but these are much less admissible ordinarily, though they are occasionally serviceable. There can be no doubt that the effect of pills administered by some quacks, which is sometimes really marvellous, is due to powerful drastic purgatives which they contain.

Diuretics are beneficial in some forms of dropsy. Those usually given are nitrate, acetate, or citrate of potash or soda in full doses freely diluted; cream of tartar in small doses; spirits of nitre; infusion or tincture of digitalis, or the powdered leaf made up into pills with other ingredients; squill in the form of tincture or pills; spirits or infusion of juniper; infusion of fresh broom-tops; oil of turpentine. The following pill will be found in some cases to have a good effect, given every other night: R. Ext. elaterii, gr. $\frac{1}{6}$ to gr. $\frac{1}{2}$; pulv. scillæ, gr. $\frac{1}{2}$ to gr. j; pulv. digitalis, gr. $\frac{1}{2}$ to gr. j; ext. hyoseyami, gr. 1½. M. fiat pil.

Digitalis is also used as an external application, poultices of the leaves being placed over the abdomen, or the powder rubbed in, or fomentations with its infusion employed. Gin or whisky freely diluted is undoubtedly efficacious as a diuretic in some cases.

Bloodletting is recommended in some instances, with the view of unloading the vessels and thus assisting the action of other remedies, but such treatment can rarely be indicated.

4. *Removal of the Fluid by Operation.*—If dropsy cannot be got rid of in any other way, it is necessary to have recourse to certain operations, and I believe they are often delayed until too late a period, and

ought in appropriate cases to be performed, not as last resources, but as curative measures. These operations are: 1. Paracentesis or tapping of serous cavities, especially to be adopted in certain cases of ascites. 2. Acupuncture or scarification of the skin in cases of anasarca. It is generally quite sufficient to make several punctures in dependent parts, repeating them as often as required, and taking care that they are not inflamed by urine or other sources of irritation.

5. *Improvement of the Condition of the General System, and especially of that of the Blood.*—Treatment directed to the objects just mentioned is generally of much service, and it may be the chief thing called for, as in cases of dropsy due to anæmia. The digestive and nutritive functions must be attended to, as well as the diet, which should be of a nutritious character, without much liquid. All hygienic conditions must be properly regulated. Tonics are often indicated, and above all some preparation of iron, especially the tincture of the perchloride, which has a marked influence upon the composition of the blood.

6. *Prevention of Irritation of Dropsical Parts.*—It is important to keep all external dropsical parts clean and dry, to prevent them from being unduly pressed upon, and to ward off all other sources of irritation.

CHAPTER III.

HÆMORRHAGE.

HÆMORRHAGE signifies an escape of blood out of the current of the circulation, either from the heart itself or from the arteries, capillaries, or veins. *Capillary hæmorrhages* are most frequent in medical practice. Generally the vessels are ruptured, but it is supposed that bleeding may occur without actual destruction of their walls, as it may be impossible to discover any lesion even on the most careful examination, and it is known that the corpuscles, both red and white, can make their way through the coats of the vessels.

The blood may be poured out on a free cutaneous, mucous, or serous surface; or into the interstices of tissues, the substance of organs, or morbid growths. An accumulation of blood in a solid organ is named an *extravasation*, *apoplexy*, or, under certain circumstances, a *hæmorrhagic infarct*.

Special names are used to indicate whence the blood comes, of which the chief are *epistaxis*, or bleeding from the nose; *hæmoptysis*, from the air-passages or lungs; *hæmatemesis*, from the stomach; *melæna*, from the bowels; *hæmaturia*, from the urinary organs; *menorrhagia*, from the female genital organs.

Certain general terms are often applied to hæmorrhages, with the view of classifying them, the meaning of which is sufficiently obvious. Thus they are said to be *traumatic* or *spontaneous*; *idiopathic* or *symptomatic*; *active* or *passive*; *arterial*, *venous*, or *capillary*; *vicarious*, *critical*, and *periodical*.

PATHOLOGY AND ETIOLOGY.—The causes, including those of a pathological nature, which give rise to hæmorrhage, may be thus arranged: 1. *Traumatic*. A vessel may be directly injured, as by a cut or contusion; by hard and rough substances, such as a calculus in the bladder, a foreign body, or dry, hard fæces in the alimentary canal, or by the extension of ulceration, gangrene, or cancer. 2. *Congestion leading to extreme distension of the vessels*. All forms of congestion may end in hæmorrhage, but especially if the force of the circulation is at the same time much increased, the pressure becoming so great as to cause the vessels to give way. Therefore whatever can occasion considerable congestion may bring on hæmorrhage, which is then usually of the capillary variety. As illustrations may be mentioned hæmorrhage into the stomach, following cirrhosis of the liver; critical and vicarious hæmorrhages; those resulting from over-straining or local irritation; and that which follows *embolism*. 3. *Morbid conditions of the walls of the heart or coats of the vessels*. Among the most important are degeneration or aneurism of the cardiac walls; atheromatous or calcareous degeneration of the arteries; arterial aneurisms; varicose veins; degeneration or mere functional debility of the minute vessels. Where the vessels are not well supported, as in the brain, or when the tissues are functionally weak, hæmorrhage from this cause is much more likely to take place. The feeble new vessels in recent inflammatory exudations, and those in certain vascular cysts or villous growths are very liable to give way. 4. *Abnormal state of the blood*. This often predisposes to hæmorrhage, *e. g.*, in anæmia, especially if this is due to previous bleeding, scurvy, purpura, low fevers, particularly typhus, and small-pox, the condition induced by bad diet, chronic diseases, and other lowering agencies. The most important morbid condition of the blood, however, which gives rise to hæmorrhage, is that which is met with in the so-called *hæmorrhagic diathesis* or *hæmophilia*, where excessive bleeding occurs spontaneously or from very slight causes; in this affection there is a marked deficiency of fibrin, with an excess of red corpuscles. A plethoric state of the vascular system is favorable to some forms of hæmorrhage, and hence this may be predisposed to by overfeeding, sedentary habits, and other causes of plethora.

Hæmorrhage may occur at any time of life, but it is most common about the period when growth and development are proceeding rapidly, and in advanced life when the tissues have undergone degeneration. It is also prone to affect different parts at different ages; thus in the young epistaxis is frequent; in young adults hæmoptysis; later on,

hæmatemesis, melæna, and hæmaturia are more common; and in old age cerebral apoplexy. Some individuals are much more liable to hæmorrhage than others.

ANATOMICAL CHARACTERS.—When hæmorrhage has taken place from the capillaries of a mucous membrane, it is often impossible, even on the most careful examination, to detect the vessels from which the blood has escaped. Some believe that under these circumstances there has not been any actual rupture. Generally the source of the bleeding may be discovered, and remnants of the blood are seen. *Extravasations* vary in size from minute points to large clots, which are either distinct and well-defined or mixed up with the tissues of the structure involved; there may be one or more. The blood is generally found coagulated more or less firmly, and presents a dark color at first. It may cause irritation of the surrounding tissues, as evidenced by redness, inflammatory exudation, softening, or even the formation of an abscess. If the extravasation does not soon prove fatal, the following changes take place in it: 1. The color gradually becomes paler, changing to brown or yellow, and ultimately it may become almost white; at the same time a granular pigment often forms with crystals of hæmatoidin. 2. The clot contracts in size, becoming firmer and being surrounded with a strong fibrous capsule, it also frequently itself undergoes organization into fibrous tissue and becomes vascularized, in which condition it may remain permanently. 3. In some cases it is absorbed, leaving a cystic cavity containing fluid, which may ultimately be taken up also, the walls of the cyst coming together and a hard cicatrix remaining, which is sometimes colored by pigment. Occasionally nothing is left but altered blood pigment of a yellow or black color, especially on membranes; or there may be no trace of a previous hæmorrhage except a puckering and contraction. In some instances a clot softens and assumes a puriform appearance.

SYMPTOMS AND EFFECTS.—Active hæmorrhage is often preceded by premonitory symptoms. There may be general excitement of the circulation, with a quick, sharp, and full pulse; or local sensations of weight or fulness and heat are complained of, with increased pulsation, the extremities being at the same time cold. Special symptoms frequently indicate the approach of bleeding in connection with particular organs.

The actual symptoms may be *general* and *local*.

General.—According to the quantity of blood lost and the rapidity with which it escapes, hæmorrhage may either prove speedily fatal or give rise to faintness or syncope, or merely originate an anæmic condition.

Local.—These necessarily vary with the seat and amount of the hæmorrhage. Instant death may result from the mere local effects of the blood effused. The symptoms usually observed are dependent

upon: *a.* Mechanical interference with the functions of an organ, owing to the mere presence of the blood, as when it escapes into the pericardium and presses upon the heart, or when a large quantity accumulates in the bronchial tubes. *b.* Destruction of tissues, which may be broken up or lacerated. This generally happens when extravasation takes place into the substance of an organ, the functions of which are thus materially disturbed. *c.* Irritation by the coagulated blood, which may give rise to more or less local inflammation with its accompanying symptoms. *d.* Excitation of certain acts which have for their object the discharge of the blood, should it escape on a free mucous surface. Thus blood in the stomach often causes vomiting; in the air-passages it excites cough. The amount and characters of the blood which is rejected vary considerably, and valuable indications are usually thus afforded as to the source of a hæmorrhage. It is often more or less mixed with secretions and other substances. The presence of blood may be indicated by *physical signs*, as, for instance, when it accumulates in the bronchial tubes or pleural cavity.

TREATMENT.—It is only intended at present to point out the general principles and indications which are applicable to the treatment of hæmorrhages, as each variety will demand particular consideration in future chapters.

1. The first indication is to stop the bleeding, should this be desirable, and to prevent its recurrence. It is not always advisable to check hæmorrhage, provided it is not serious in amount, for it may be the means of warding off some worse evil, as in many cases of bleeding from piles, or in those of epistaxis. Usually it needs to be stopped, and the following are the measures to be employed for this purpose:

a. Absolute rest of the body in the horizontal posture is frequently indicated, and, so far as this is practicable, the part from which the blood comes should be kept quiet, every disturbing action being avoided, such as cough in hæmoptysis, or vomiting in hæmatemesis. At the same time the circulation must be calmed, and everything that can excite the heart be guarded against. If the heart is acting unduly, cardiac sedatives are most valuable. Venesection is employed with the view of lowering the action of this organ, but this measure is very rarely indicated.

b. Attention to *position* is sometimes most serviceable, with the object of assisting the return of blood by the veins. Everything that can impede the venous circulation must be avoided.

c. The administration of astringents in full doses is generally called for in medical practice, the most important being acetate of lead, gallic and tannic acids, sulphuric acid, alum, oil of turpentine, ergot of rye, matico, and tincture of steel. Some of these may be advantageously combined, and either tincture of opium or digitalis frequently forms a most useful addition. A subcutaneous injection of ergotin has been

employed with success. Everything in the shape of food or drink should be taken cold, and stimulants must not be given unless absolutely required. In some hæmorrhages the constant sucking of ice is exceedingly serviceable.

d. Local remedies are commonly indicated, such as pressure; astringent applications; cold, especially in the form of ice, which may be usefully applied to *neighboring* parts, *e. g.*, to the chest or epigastrium in hæmoptysis and hæmatemesis, or even to distant parts, as in cases of epistaxis. It may be necessary to have recourse to surgical measures, such as the actual cautery, torsion, or ligature.

e. It is highly important to improve the general condition of the patient and the state of the blood, should these be at fault and give rise to a tendency to bleeding, by the exhibition of good diet, tonics, tincture of steel, and similar remedies. In this way hæmorrhage may be prevented when it tends to recur. On the other hand, when it is associated with a full plethoric habit, the administration of saline aperients from time to time is very serviceable, while the diet must be restricted.

f. Sometimes it is advisable to draw off blood to parts distant from the seat of hæmorrhage by means of heat or sinapisms to the extremities, Junod's boot, leeches, etc.; or to prevent it from entering a part by the aid of pressure upon the main arteries.

2. The second indication is to attend to the general effects of the loss of blood. *Syncope* must be treated by position and stimulants, as will be more fully described hereafter. Anæmia calls for the administration of some form of iron, with proper dietetic and hygienic management.

3. The local effects of effused blood must also receive attention. In rare cases it may be desirable to have recourse to some surgical operation in order to remove an accumulation. Usually it is only requisite to keep the part affected entirely at rest, and to employ measures which promote the absorption or removal of the effused blood. Iodide of potassium and blisters are often very useful for the purpose of aiding absorption. If inflammation is set up, this must be treated by appropriate remedies.

CHAPTER IV.

INFLAMMATION.

WITHOUT attempting any comprehensive definition of this most important pathological process, I proceed at once briefly to consider the principal points in connection with it, and to endeavor to give such information regarding the present state of knowledge on the subject as the limits of this work permit. It will be most convenient first to de-

scribe the morbid changes which take place in inflammation, and to point out in what they essentially consist.

HISTOLOGICAL CHANGES.—These may be studied by irritating the transparent vascular tissues of animals and watching the results with the aid of a microscope. The web of the frog's foot, its mesentery or tongue, and the bat's wing, are most commonly employed for this purpose, and the following phenomena are observed :

A. Changes in connection with the Bloodvessels, Circulation, and Blood.—The phenomena associated with the vascular system constitute a most important element of the inflammatory process, and they occasion some of the more obvious anatomical signs of the change, such as redness, increased heat, etc.

1. *Bloodvessels.*—In almost all cases an immediate dilatation of the small arteries is observed, and they become elongated and tortuous; the dilatation increases for some ten or twelve hours and then remains stationary. Rarely there is a primary contraction of short duration. The veins enlarge after awhile, and they assume a varicose or aneurismal aspect, presenting little irregular bulgings and contractions. The capillary walls undergo structural changes in course of time, fat-granules accumulating in them, especially around the nuclei, and they send out processes by budding, which finally join together.

2. *Circulation.*—There is at first *increased rapidity* in the flow of blood, except when contraction of the arteries takes place. This is soon followed, however, by a rather sudden return to the normal rate of movement, and afterwards the circulation becomes slower, this change commencing in the veins. A to-and-fro oscillation is then often seen, and finally complete *stasis* or stagnation occurs, the vessels appearing to be crowded with red corpuscles. Neighboring vessels frequently present all these different conditions with regard to movement, and around the centre of stasis the vessels are usually over-distended, the circulation being slow, while still beyond this circle the current of blood is more rapid.

3. *Blood.*—Important phenomena are observed in connection with the blood-corpuscles. The *white corpuscles* accumulate in the vessels, especially in the veins, and they adhere to the walls, forming a continuous, motionless layer, the central current still persisting until stasis is brought about. Some observers believe that there is an actual production of these corpuscles in the inflamed part, and that thus their number is increased. After a time they penetrate the walls of the capillaries and may be observed in various stages of their transit, forming button-shaped elevations, then hemispherical prominences, then pear-shaped bodies, and finally separating altogether. This process is due to the power which these corpuscles possess, by virtue of their amœboid nature, of spontaneous movement, of altering in shape and digesting the protoplasm of the vascular walls, so that no actual open-

ings are left in the vessels to indicate where they have escaped. To the liberated white corpuscles the name *leucocytes* is given, and after they leave the vessels they send out processes, assume peculiar shapes, and *migrate* far and wide into the surrounding tissues, at the same time often undergoing a process of division and thus becoming increased in number. The *red corpuscles* exhibit the same tendency to aggregation and stasis, and they may so adhere to each other that their outlines are quite obscured. They also migrate through the walls of the vessels, especially the capillaries, but not nearly to the same extent as the white blood-cells. Dr. Lionel Beale affirms that in inflammation minute particles of *bioplasm* or germinal matter of the blood pass through small rents or fissures in the capillary walls, and afterwards grow and multiply by division. Some of these particles, he says, are detached from white corpuscles. He considers that most of the particles seen outside the vessels originate in this way and not from the direct transit of white corpuscles.

Another phenomenon almost invariably occurring in connection with the blood is, the exudation of its liquid portion out of the vessels into the surrounding tissues. Though usually called *liquor sanguinis*, the exuded liquor is rarely identical with this fluid in its composition. It may be mere serum, but as a rule contains fibrin as well as albumen, and also a considerable proportion of phosphates, chlorides, and carbonates. Its nature and quantity will vary much, according to the seat and intensity of the inflammation, as will be more fully alluded to further on.

The alterations thus far described in connection with vascular tissues cannot, of course, be observed in those which have no vessels, such as cartilage; but they may then be noticed in the vessels of the neighboring tissues from which the nutriment for the non-vascular structures is derived.

B. Changes in the Affected Tissues.—The nutritive process in the inflamed tissues themselves becomes speedily disturbed when inflammation sets in, and in some structures this is the only perceptible deviation from health, there being no appreciable amount of exudation. Such inflammations are named *parenchymatous*, and are observed in connection with cartilages and certain organs, such as the kidneys. The first tendency is to the active production of cells—*cell-proliferation* or *germination* as it is termed; this results from the increase in size of those already existing and of their nuclei, and the division of the latter along with the protoplasm of the cell-contents, which frequently assume a granular appearance, new cells being thus produced by *endogenous* formation. They also undergo many changes in form and exhibit amoeboid movements. This cell-proliferation is in proportion to the intensity of the inflammation, but varies greatly in different tissues. In epithelial structures it is very rapid; less so in connective tissue,

cartilage, bone, and the cells of organs ; and it does not occur at all in the higher tissues, such as nerve. These new cells are prone to decay, especially if they are very quickly produced and the inflammation has been severe ; but they may develop into a permanent tissue, which tends to be of lower organization than the original. Where intercellular substance exists, this often softens and breaks down ; and the entire structure may become at last completely destroyed, the histological elements being involved in the destruction. Dr. Beale describes the *bioplasm* of inflamed tissues as increasing greatly in amount.

PATHOLOGY.—I proceed now to consider the nature and origin of inflammation, and to attempt to explain the phenomena described above. Formerly it was believed that the various changes observed in inflammation could be accounted for on physical principles. Thus the disturbance of the circulation and ultimate stasis were attributed to dilatation of the vessels ; to blocking up of the capillaries by the successive production of white corpuscles, and the adhesion of these, as well as of the red globules, to the walls of the vessels and to each other ; to the formation of minute coagula ; and to inspissation of the liquor sanguinis. Exudation was believed to be the necessary result of this stasis and of the dilatation of the vessels. Of late years, however, there has been a growing conviction that the phenomena of inflammation are due to some disturbance in the mutual vital relations of the tissues, bloodvessels, and blood. This pathological process, affecting the nutritive conditions and being in fact merely an alteration in nutrition, results from some injury to or irritation of a tissue, either direct or indirect. An impression is thus produced on the centripetal or sensory nerves, which is communicated to the vaso-motor centre, thence reflected to the centrifugal or vaso-motor nerves and conveyed by them to the vessels, which consequently dilate, probably owing to a paralysis of their muscular coat. The primary acceleration of the flow of blood may be due to this dilatation, but the subsequent phenomena are probably the result of some alteration in the vital properties of the living tissues, including the coats of the vessels, the blood, and the surrounding structural elements. The vascular walls are so modified as to lead to stasis of the blood-current, the corpuscles readily adhering to them, while they allow of the free passage of liquid and leucocytes, having lost their resisting power. The blood-corpuscles also exhibit an increased tendency to aggregate together. With regard to the cell-proliferation and increase of bioplasm, this is supposed to be due to the direct influence of the abundant supply and frequent change of the nutritive fluid which escapes from the vessels in stimulating growth and development, and to the increased heat accompanying the inflammatory process. It is not unreasonable to suppose, however, that the primary irritation may immediately set up this overgrowth, or that it may be originated through the nerves directly ; while it may possibly

itself tend to promote a free escape of fluid from the vessels, because it causes a greater demand for nutriment. Some pathologists believe that the whole process of inflammation is due to a direct change in the vessels or blood, set up by the molecular tissues of the part affected, and that it is not produced by any nervous influence.

PATHOLOGICAL TERMINATIONS AND PRODUCTS.—1. The changes already described having taken place to a greater or less extent, what is termed *resolution* may follow, viz., a subsidence of the vascular disturbances and the absorption of any exudation, the tissue affected being restored to its normal condition. Any leucocytes which are present either undergo fatty degeneration before absorption, or possibly may re-enter the bloodvessels or lymphatics. Resolution may take place very quickly, this being termed *delitescence*; or *metastasis* may happen, i. e., the disappearance of inflammation from one part with its simultaneous appearance in another.

2. *Exudation and Effusion.*—As has been already stated, inflammation is usually attended with an escape of fluid from the vessels, varying much in quantity and composition. The material exuded may be either *serum*, *fibrinous exudation* or *lymph*, *blood*, or *mucin*.

a. *Serum.*—Examples of this effusion are well seen in connection with inflammation of serous membranes, and in the submucous tissue in certain parts. The fluid is not uniform in its composition and characters, but contains a variable amount of albumen and frequently also a little fibrin, with a considerable quantity of phosphates and chlorides. It may remain for a long time unaltered, or is absorbed if the inflammation subsides, or becomes more or less purulent.

b. *Fibrinous Exudation, Lymph, Coagulable Lymph, Inflammatory Exudation.*—These terms are applied to an exudation which attends some forms of inflammation, the material exuded containing more or less fibrin, and being spontaneously coagulable. There is really, however, no distinct line of demarcation between this exudation and inflammatory serous effusion. It contains a number of leucocytes, as well as cells resulting from proliferation of those of the involved tissue, and Dr. Beale describes particles of *bioplasm* as being present in it.

Two kinds of lymph are recognized, viz., the *plastic* or *fibrinous*, which contains abundant fibrin-forming ingredients, tends to coagulate, and promotes tissue-development; and the *aplastic*, *corpuscular*, or *croupous*, in which there are a large number of cells, with but little tendency to organization, but rather a proneness to degeneration and to the formation of pus or other low products. The state of the patient, the seat and intensity of the inflammation, and other conditions influence materially the nature of the exudation.

After inflammation has subsided the exudation frequently undergoes organization into a new tissue; some are of opinion that only the leucocytes and the cells produced by proliferation, or the particles of bio-

plasm (Beale) become developed, the liquid portion merely nourishing these; others believe that the fibrin coagulates and fibrillates, and itself contributes to the formation of tissue. Probably most of the new material is usually derived from cell-development, the cells being partly leucocytes and partly due to proliferation. Some kind of connective or fibrous tissue is that generally produced, but bone, elastic tissue, epithelium, or fat may be ultimately formed. Certain of the higher tissues, such as muscle or nerve, are never developed under these circumstances. This organization is well seen in the changes which occur in the granulation-tissue by which wounds cicatrize, and in the adhesions and thickenings formed in connection with inflamed serous membranes. The consequences of these changes are often very serious, structures becoming thickened, hardened, contracted, or bound together, and transparent tissues being rendered opaque.

After organization a process of degeneration may set in, as shown by wasting or withering, the substance becoming dry, yellow, horny, and stiff; by fatty or liquefactive change, which may lead to its absorption, or by the formation of black pigment. Similar changes may occur in the products of corpuscular lymph.

c. *Blood* is sometimes present in inflammatory exudations. It is partly the result of migration of the red corpuscles, but may be due to the actual rupture of vessels, especially of those recently formed.

d. *Mucin*.—In inflammation of mucous membranes this substance is sometimes met with, and gives a tenacious, stringy character to the fluid discharged from the surface.

3. *Suppuration or Formation of Pus*.—The tendency to suppuration varies according to the tissue affected and the constitutional condition of the patient, but it generally is more liable to take place if the inflammation is very severe and concentrated. Pus may form on a free surface and be discharged, being then often mixed with other materials; it may accumulate in cavities, such as those of serous membranes, or it may involve the substance of tissues and organs, either as a circumscribed abscess, or as diffuse purulent infiltration. In its physical characters, it is a thick, viscid, pale-yellow liquid, odorless, alkaline in reaction, with a specific gravity of about 1030. It consists of a fluid, *liquor puris*, in which float pus-corpuscles and other microscopic particles. *Liquor puris* is an albuminous fluid, but also contains salts, pyin, chondrin, and fat. The corpuscles closely resemble pale blood-corpuscles in size and appearance, being more or less round, or sometimes irregular, granular, and having one or more nuclei, which are rendered more evident by acetic acid and often break up when acted upon by this reagent. They have the power of spontaneous movement and migration, and can alter in form as well as increase in number by fission. Dr. Beale describes pus corpuscles in the *living* state as being masses of bioplasm without any cell-wall, which assume a variety of forms, but are never

spherical, send out protrusions in all directions, these becoming detached and forming new corpuscles, and which are capable of spontaneous movement. He says that when *dead* they assume the spherical shape, their movements cease, a sort of cell-wall forms, they become more granular, and bacteria are developed in them. It is in this condition they are usually seen under the microscope. It is now generally considered that the great majority of these cells, especially in the earlier stages of inflammation, are merely leucocytes. Beale believes they are derived from the particles of bioplasm which escape. Afterwards others are formed by the proliferation of the cells and germinal matter of the tissue affected, and they increase in number by cleavage and endogenous formation. These leucocytes possess the power of destroying the tissues with which they come into contact, and it is partly in this manner that an abscess makes its way to the surface.

Various kinds of pus are described, such as *healthy* or *laudable*, *ichorous* or *watery*, *serous*, *sanious*, etc. It may decompose and form very noxious gases, and sometimes undergoes physical and vital changes if not discharged, its fluid portion being absorbed, its cells becoming withered and undergoing fatty degeneration, so that it is converted into a cheesy mass, containing fat-granules, shrivelled cells, and nuclei. Ultimately it may calcify.

4. *Softening* of tissues is not an uncommon result of inflammation, and it may proceed to such a degree as to end in the complete breaking up and destruction of the structures affected. This may be illustrated by the softening which accompanies inflammation of the brain.

5. *Induration* is another consequence of inflammation, especially when chronic, being due to the substitution of an imperfect fibrous tissue for the normal structures.

6. *Interstitial absorption* is sometimes observed, as in the case of inflammation of bone.

7. *Ulceration*.—When inflammation destroys the tissues on a surface an *ulcer* is produced. If this is quite superficial, only epithelium being removed, it is termed an *excoriation* or *abrasion*. Ulcers of different kinds frequently come under the notice of the physician in connection with mucous surfaces. Usually there is a discharge of pus after the inflammatory process subsides. An ulcer tends to cicatrize by the development of granulation-tissue into fibrous tissue, which afterwards is liable to contract, and may thus lead to serious consequences. Ultimately the original structures may be developed anew, but this is not accomplished for a long time, and, as already stated, some tissues are never reproduced.

8. *Gangrene* or *Mortification*.—If inflammation is very intense, rapid death of the involved tissue in mass may result under certain circumstances, and a slough is formed, which becomes isolated from the living textures and undergoes a process of separation, leaving an ulcerated

surface. This is the consequence of direct injury to the vitality of the structure, of the stagnation of blood, and of the injurious effects produced by the exudations. Almost any tissue may mortify from this cause, but gangrene is particularly observed in the subcutaneous areolar tissue, and in the mucous membrane of the alimentary canal, being rarely seen in organs. It is of the moist kind, and therefore the slough is liable to undergo decomposition.

Such being the general nature of the pathological products and terminations of inflammation, it must be remembered that these differ materially according to the structure involved. This may be illustrated by a comparison between the results of inflammation affecting serous and mucous membranes respectively.

In *serous inflammations* there is at first marked redness, with loss of polish, more or less opacity, and thickening of the membrane. Then a fibrinous exudation is deposited on the surface, varying much in its amount, characters, and arrangement, which contains abundant cells, chiefly leucocytes, but partly derived from cell-proliferation in connection with the epithelium. At the same time an effusion of fluid takes place into the serous cavity, which is more or less turbid, and contains coagula as well as abundant cells similar to those in the fibrinous layer. The further tendency is usually to the absorption of this fluid and to the formation of thickenings, adhesions, or agglutinations in connection with the serous membrane. These are generally supposed to result from the organization of the layer of lymph with its inclosed cells, fibrous tissue being thus developed. It has been stated, however, that, at least in many cases, this fibrinous layer does not become organized, but undergoes fatty degeneration and is absorbed; and that the adhesions result from the development of small vascular papillæ or granulations which form on the surface of the membrane under the epithelium. If the inflammation is very intense or prolonged the fluid may become purulent, and this is also apt to occur in certain constitutional conditions.

Though serous inflammations vary much in their extent and products, it may be stated that their general tendency is to produce materials which are capable of organization.

In connection with *mucous membranes* three varieties of inflammation are described, viz., *catarrhal*; *croupous*, *membranous*, *plastic*, or *fibrinous*; and *diphtheritic*.

Catarrhal.—This is the ordinary form. It commences with hyperæmia and swelling of the membrane, which is at first abnormally dry. Soon, however, there is an increased secretion of viscid mucus, containing abundant cells derived from the proliferation of the epithelium and from leucocytes, and, if the inflammation continues, the discharge assumes a more or less purulent appearance, owing to the large number of cells present, many of which have the precise characters of

pus-cells. The mucous glands and follicles enlarge and become also filled with cells. In some cases the submucous tissue becomes infiltrated, and if it is of lax texture a considerable amount of serum may collect in it. Abrasions or ulcers of the membrane are not unfrequently originated. If the inflammation becomes chronic, considerable changes are produced in the structure of the membrane and its glands.

Croupous.—This variety differs from the former in that a layer of so-called *false membrane* is deposited on the surface, varying in thickness and consistence. It is formed of coagulated fibrin, either amorphous or fibrillated, inclosing epithelium and other cells; or it may be entirely made up of altered epithelium cells without any fibrin. Even when distinctly fibrillated it shows no tendency to become permanently organized.

Diphtheritic.—This is supposed by some pathologists to differ from *croupous* inflammation in that there is a fibrinous exudation, not only upon but into and beneath the mucous membrane, which, as a consequence, is destroyed and converted into a slough, and an ulcerated surface is left on its separation.

It will thus be seen that inflammation of mucous membranes differs from that of serous membranes in that the products have no tendency to become organized, owing to the abundance of cellular elements which are discharged in the secretions.

SYMPTOMS.—1. *Local*. If an inflamed part is visible, it generally presents three well-known *objective* symptoms, viz., *redness, swelling, and increased heat*.

The *redness* varies in degree and hue, the latter usually tending towards brightness. It is more marked towards the centre of the inflamed area, and fades off at the circumference, disappearing more or less under pressure. It is due chiefly to the overloading of the vessels and to the blood stasis, but may be partly the result of migration of red corpuscles or rupture of vessels and consequent extravasation. In the case of a non-vascular tissue, it is the neighboring structures from which this receives its nutriment which exhibit redness.

The amount of *swelling* is very variable, and it may be accompanied with a hard or soft feeling, according to circumstances. The increased quantity of blood in the affected part, and the presence of different exudations and effusions, as well as the proliferation of tissue, will account for this symptom.

Increased local heat is often quite evident to the touch, but it may only be detected by the thermometer. It is mainly the result of the increased activity of chemical and nutritive changes in the inflamed tissue, and to some extent of the augmented flow of blood through it. Dr. Beale attributes the rise in temperature to the rapid growth of bioplasm.

These objective changes are also associated with internal inflamma-

tions, but of course they are then only observed on post-mortem examination. It is often possible, however, to determine during life that internal organs and tissues are inflamed, by the aid of *physical examination*.

Pain is one of the most frequent *subjective* symptoms of inflammation, its intensity and characters differing much, according to the tissue affected; it may be entirely absent, however, even when structures are involved inflammation of which is usually attended with much pain. Anything that disturbs or irritates the affected part will generally aggravate the painful sensations, while there is almost always *tenderness* on pressure, which may exist without any spontaneous pain. Other morbid sensations, not amounting to actual pain, are often complained of. These symptoms are necessarily due to the nerves being affected in some way, either being involved in the inflammatory process or pressed upon by exudations. *Sympathetic* pains are sometimes referred to parts distant from the seat of inflammation; or pain may only be felt in some structure which is supplied by the same nerve as that which is affected.

The *functions* of inflamed organs and tissues are always disturbed, and those of adjoining parts are often implicated as well. This disturbance is the result of actual changes in the textures, of the mechanical effects of the various materials which accumulate, and of the acts which these frequently excite with a view to their removal, such as cough in bronchitis. By observing therefore to what organs any symptoms present are referable, the seat of an inflammation can generally be fixed upon. Secretions are always modified as to quantity and composition when the organs forming them are inflamed.

2. *General or Constitutional*.—At present it must suffice to state that the *general* symptoms of *acute* inflammation are those of *fever* or *pyrexia*, which will be hereafter described. The fever is usually of the *inflammatory* type at the outset, but differs much in its intensity, especially according to the tissue affected. The occurrence of suppuration is often indicated by a severe fit of shivering, and the fever is then apt to become *adynamic* or *hectic*. *Typhoid* or *adynamic* symptoms are also liable to be developed under other circumstances, but particularly if the inflammation assumes a low type, or if it terminates in gangrene.

As a rule the *blood* is hyperinotic, containing excess of fibrin and coagulating firmly, often presenting the "buffy" coat. Water is in excess, but albumen and salts are deficient. The red corpuscles show a marked tendency to run together, and under the microscope are seen to form "rouleaux."

The fever attending inflammation is *symptomatic* or *sympathetic*, and it is supposed to result either from paralysis of the vaso-motor nerves generally or from increase in the temperature of the blood as a whole, in consequence of the local excessive production of heat.

ETIOLOGY—A. *Predisposing Causes.*—These influence not only the occurrence of inflammation, but also the part it affects and the variety it assumes. They may be considered as *general* and *local*.

1. *General.*—The condition of the entire system, but especially that of the blood, exercises a considerable influence in predisposing to inflammation. The most important general predisposing causes are debility with impoverishment of the blood, however originated; plethora, especially from overfeeding, with excessive indulgence in stimulants and general luxurious habits; and, above all, the presence of some morbid material or poison in the blood, as in the case of the eruptive fevers, gout, rheumatism, syphilis, diabetes, etc., or when the products of tissue-change accumulate in the blood, either from too rapid disintegration, as in fevers, or from deficient action on the part of the excreting organs, especially the kidneys and skin. Children and old people are most liable to inflammations on the whole, but this does not apply to all structures. Persons of sanguine temperament are also said to be more predisposed than others.

2. *Local.*—The chief local predisposing causes of inflammation are mechanical or passive congestion; defective nutrition of the tissues, their power of resistance being impaired, as after a previous attack of inflammation, or when the vessels are in a state of degeneration; and impaired innervation. The last cause acts partly by direct interference with the nutritive process, and by lowering the vitality of the tissues, but chiefly by diminishing the power of sensation and motion, so that irritants are allowed to act for a long time without the patient being aware of their presence, who is also unable to remove them.

B. *Exciting.*—1. *Mechanical injury or irritation* of various kinds is a common cause of inflammation. Thus it may result from wounds or bruises, calculi, extravasated blood, retained excretions, worms, tumors, gouty concretions, and different deposits.

2. *Chemical irritants* also frequently excite inflammation, and under this head may be included that resulting from the application of extreme heat or cold. A specific kind of inflammation may be produced in this way, as, for example, when croton oil, tartar emetic, or a blister is applied to the surface of the skin, or when arsenic or cantharides is introduced into the system, the former always affecting the stomach, the latter the kidneys. The inflammation resulting from the contact of air with certain surfaces or of pus or gangrenous fluids, comes under this category, as well as that due to improper food.

3. Certain *specific organic poisons* in the blood are most important causes of inflammation, each giving rise to its own *specific lesions*, and affecting particular structures. They may be *introduced from without*, by methods to be hereafter described, as in the case of the various contagious diseases, or be *generated within the system*, of which the morbid agents originating acute rheumatism and gout afford illustrations.

The materials formed as the result of excessive destruction of tissues may also act as exciting as well as predisposing causes of inflammation.

4. Internal inflammations are often caused by conditions which give rise to a "chill," such as exposure to cold and wet, or to a draught when the body is hot and perspiring. These act principally by contracting the small cutaneous vessels and driving the blood inwards; but partly by interfering with cutaneous excretion, in consequence of which noxious materials accumulate in the blood.

VARIETIES.—Inflammation presents many varieties, to which particular names are applied, these being founded on different characters. Thus it is said to be: *a. Acute, subacute, or chronic*, according to its intensity and rate of progress. *b. Sthenic or asthenic*, according to the general symptoms present. *c. Plastic, adhesive, suppurative, ulcerative, or gangrenous*, according to its products and mode of termination. *d. Circumscribed or diffuse*. *e. Healthy or phlegmonous, or unhealthy*. *f. Primary or idiopathic, or secondary*. *g. Non-specific or specific*, the latter including rheumatic, gouty, syphilitic, gonorrhœal, strumous, tubercular, etc.

TREATMENT.—It is not easy to give even a general outline of the treatment of inflammation, as this has to be so much modified under different circumstances. At present only the chief principles of its management will be briefly pointed out.

A. It is important to take measures to *prevent* inflammation, should there be any condition present in which it is likely to be set up. For instance, after an injury the part affected should be kept at rest and appropriate remedies applied. In conditions of the blood which tend to cause secondary inflammations, every care should be taken to ward off such influences as are likely to produce this result. If there is paralysis of any part, all local sources of irritation must be avoided. These illustrations will suffice for this point.

B. Supposing inflammation to have been established, the main indications for treatment, and the means for carrying them out, are as follows:

1. The first indication is to subdue the morbid process as soon as possible, and prevent or limit the accumulation of various exudations and effusions. In order to carry this out it is essential to *remove the cause* of the inflammation, if practicable; to keep the part affected in *as complete a state of rest as possible*, physiological as well as physical; to avoid every source of irritation; and in many instances to attend to *position*, so as to prevent accumulation of blood. Thus further disturbance will be avoided, and the conditions be most favorable for recovery.

The active measures employed are those usually termed *antiphlogistic*, and they have for their more immediate object the lowering of the

increased vascular action in the inflamed tissue. It is necessary to allude briefly to those which are most important.

a. *Removal of Blood.*—This was the great remedy for inflammation in times past, but at the present day the tendency is to go to the opposite extreme, and to ignore bloodletting altogether. Blood may either be removed by *venesection—general bloodletting*—by which the heart's action is at the same time moderated; or it may be taken immediately from the vessels in the neighborhood of the affected part by means of leeches, cupping, punctures, scarifications, or incisions—*local bloodletting*. With regard to the former method, without entering into any discussion on the subject, I venture to express the opinion that it is not often required, and great care should be exercised in determining that any individual case demands it. As will hereafter be pointed out, inflammation of certain tissues and organs may necessitate venesection, but it should never be practiced if the patient is debilitated, or if the inflammation is dependent upon some morbid poison in the blood. If performed at all it should be had recourse to at an early period, before inflammatory products have accumulated to any extent. Local bloodletting is frequently most serviceable, and there can be no doubt that it is not made use of to the extent which it deserves. By this means the vessels of a part can be materially relieved, and thus a most beneficial local effect produced, while the general bulk of the blood is not materially diminished or the patient injured in any degree.

b. Some powerful medicinal agents have of late years been much recommended in various inflammations, which exercise a direct influence upon the heart, diminishing the number of its beats. Of these the most important are *aconite*, *veratrum viride*, and *digitalis*. Tincture of aconite is strongly advocated by Dr. Ringer in certain inflammations, especially such as are not extensive or severe.

Tartar emetic has long occupied a prominent position in the treatment of certain inflammations, and justly so; it exerts a powerful influence over the heart, but acts in addition by increasing some of the secretions.

c. A very valuable class of remedies in some inflammations, if properly employed, are those which increase the different secretions, and thus relieve the bloodvessels, viz., *purgatives*, *diaphoretics*, and *diuretics*. The first of these must be used cautiously, but it is generally advisable to keep the bowels freely open, and purgatives are particularly useful when the blood is loaded with the products of decomposed tissues. The best *diaphoretic* is some form of bath, especially the vapor, hot-air, or Turkish bath. The new drug—*Jaborandi*—which is a powerful diaphoretic, may be found useful in some inflammations. Salines are frequently of much service. Of course these classes of remedies are severally contraindicated if there is any local inflammation of the bowels, skin, or kidneys.

d. Local Treatment.—There are certain important local means of subduing the increased vascular action in inflammation, in addition to bleeding. Among these the most valuable is the *application of cold*. It may be applied in the form of rags dipped in cold water or evaporating spirit lotions, cold irrigation, ice or ice and salt in a bag. It is in the early stage that this remedy is so useful, and also when the inflammation is quite superficial or affects structures near the surface. *Heat and moisture* act very beneficially in some cases, in the form of hot-water dressing, poultices, or hot fomentations. In others turpentine fomentations, dry cupping, mustard poultices, or blisters, are valuable. All these act by determining the blood to the surface. The application of belladonna has been recommended in inflammation of superficial parts.

2. The second indication is to endeavor to promote the absorption or removal in some other way of any morbid materials which have been exuded, so as to leave the implicated organ or tissue in as normal a condition as possible. This will be favored by attention to many of the points already mentioned, such as *rest* and *position*. In order to aid absorption certain medicinal agents are extensively used. Of these *mercury* in some form is very commonly employed. In syphilitic inflammations this drug acts most efficiently, but as a rule it ought to be avoided, or at least used with great caution; a great deal of harm has been, and still is done by its indiscriminate use. *Iodine*, especially in the form of iodide of potassium, is often of much service. *Liquor potassæ* and the alkaline bicarbonates are also employed.

Local measures are frequently attended with excellent results, particularly the various forms of *counter-irritation*, such as blistering, painting with a solution of iodine, the use of irritating liniments, issues, setons, or the actual cautery. *Friction* and *regulated pressure* are in some cases most serviceable, and in practicing the former it may be advisable sometimes to use absorbent liniments or ointments. *Mercurial ointment* is much employed in this way.

Absorption may undoubtedly be assisted in some instances by acting freely on the various secreting organs, especially by promoting the functions of the skin by means of baths.

In some cases the products of inflammation cannot be absorbed, and then it may be necessary to have recourse to operations for their removal. In others, what has to be done is to encourage certain acts by which these products are discharged, such as the act of coughing in cases of bronchitis.

3. In the next place the *general condition* of the patient must be attended to: the various forms of *fever* met with must be treated according to the principles which will be laid down when considering this subject. If the inflammation is of *specific, constitutional* character, particular remedies are called for, such as mercury in syphilis or colchicum

in gout. In certain other forms of inflammation also, special medicines have been found most useful, such as tincture of iron in erysipelas, chlorate of potash in inflammations about the mouth and throat. *Diet* must be regulated according to circumstances, and it is impossible to lay down any definite rules, so much depending on the part affected, the state of the patient, and other circumstances. Should there be any tendency to depression, nourishing diet and stimulants are called for, often in considerable quantity, and this is especially the case if suppuration, ulceration, or gangrene sets in. *Tonics*, such as quinine, bark, mineral acids, steel, as well as cod-liver oil, are then also indicated. Of course it is necessary to pay careful attention to all hygienic conditions.

4. Every precaution must be taken against the occurrence of untoward terminations, such as *suppuration*, *ulceration*, or *gangrene*; should either of these set in, however, it must be treated by appropriate measures. The escape of pus must be encouraged or its formation checked; ulceration healed; and the separation of dead parts promoted.

5. It is often necessary to attend to *local symptoms*, these necessarily depending upon the part affected. Among these a prominent one is *pain*. For its relief many of the remedies already considered are very valuable, but the most important drug for this purpose is *opium*. It is exceedingly serviceable in many inflammations in various other ways, such as by inducing sleep, stopping the peristaltic action of muscular tissues, allaying irritability, and probably directly influencing the inflammatory process. It is contraindicated or must be given with great caution under certain circumstances, viz., if the respiratory organs, kidneys or brain are involved. *Hydrate of chloral* and other sedatives are also very useful in many cases for the relief of pain and sleeplessness.

CHAPTER V.

HYPERTROPHY.

THIS term implies an overgrowth, and ought to be strictly limited in its meaning to the "increase in an organ or structure of its normal tissue elements." The tissue may be augmented either from an enlargement of its previously existing constituents, or from the formation of new and additional elements. The latter mode of overgrowth is now termed *numerical hypertrophy* or *hyperplasia*. It must be remembered that an organ is usually made up of several tissues, either of which may be the seat of hypertrophy, and thus its active functions may be improved or the reverse. For instance, as has been pointed out by Dr.

Quain, in the heart either the muscular tissue, the fibrous tissue, or the fat may be increased, and each form is a true hypertrophy of a certain kind. In most cases, however, it is the active tissue which is increased, and the functions of an organ are promoted thereby. Muscle is peculiarly prone to become hypertrophied.

EFFECTS.—Increase in weight is the only necessary result of hypertrophy. Usually there is enlargement of an organ and sometimes change in shape, but not always. The walls of hollow organs are generally thickened. The physical characters of the tissue involved may be quite natural as regards color, consistence, etc., or they may be more or less altered. An organ may at first be the seat of hypertrophy, but afterwards undergo degeneration, as happens not uncommonly in the case of the heart. The symptoms of hypertrophy, if any, are those indicating increased activity on the part of the organ affected. There may be physical signs of enlargement.

ETIOLOGY.—1. In the great majority of cases hypertrophy is the result of *an organ or part being called upon to do extra work*, and it is truly a conservative lesion, to ward off evil consequences which might otherwise ensue. Thus, in the case of hollow muscular organs, such as the stomach, heart, or bladder, whenever an obstruction exists at an orifice or elsewhere, interfering with the exit of their contents, the tissues, especially the muscular, almost always hypertrophy. Involuntary muscular tissue is frequently hypertrophied, and this may be a natural event for a certain definite purpose, of which the pregnant uterus affords an illustration. When the elements of a secretion or excretion accumulate in excess in the blood, hypertrophy of the organ or organs whose function it is to remove them often ensues. Thus if one kidney is unable to perform its functions, the other becomes enlarged and thus does double duty. If one lung is incapacitated from any cause, the other generally becomes hypertrophied.

2. Probably *excessive action of an organ due to mere nervous irritation* may lead to hypertrophy. Palpitation of the heart, for example, does in exceptional cases cause permanent enlargement of this organ. It is a familiar fact that voluntary muscles enlarge in proportion to the degree in which they are exercised.

3. *Excess of blood flowing to a part* may unquestionably originate hypertrophy.

4. Increase in a particular tissue may result from *the presence of an excess of its formative elements in the blood*. This is illustrated by the large formation of adipose tissue in all parts of the body which is observed in some individuals whose blood contains an excess of fat.

ATROPHY,

Atrophy is just the reverse of hypertrophy, and implies a diminution in the size or number of normal tissue-elements, the former being termed

simple, the latter *numerical*, atrophy, but both forms are frequently met with in combination.

Degeneration often accompanies atrophy, and when structures actually disappear, they must necessarily pass through a process of decay during their removal. Atrophy may be *general*, involving all the tissues and fluids of the body, some, however, more than others, as is seen in old age, phthisis, or cancer; it may be limited to a *particular system*, such as the muscular or glandular; or it may only affect *one organ* or a *certain tissue* in it, *e. g.*, the heart, liver, or kidney.

EFFECTS.—Atrophy necessarily causes loss of weight, and there is usually a lessening in dimensions as well, but not invariably, and there may even be apparent enlargement. Wasted parts generally have a paler and less healthy aspect, and appear either drier and firmer, or softer than in their normal condition. Their functions are necessarily impaired.

ETIOLOGY.—1. Anything that interferes with the *proper nutritive qualities of the blood* will give rise to general wasting to a greater or less degree. Hence this may arise from direct loss of blood; deficiency in the quantity or quality of the food; diseases which interfere with digestion and absorption, as well as those which lead to the excessive removal of the nutritive elements of the blood, such as Bright's disease, prolonged suppuration, or phthisis. In cancer there is frequently an extraordinary degree of wasting, involving also the internal organs. In a case of cancer of the lungs which came under my observation the heart only weighed $3\frac{1}{4}$ ounces.

2. Combined with the foregoing cause, or acting alone, there is often *increased waste of tissue*, which cannot be repaired, as is observed in fevers and many other diseases. In some instances atrophy from this cause is limited to one organ, of which acute atrophy of the liver affords an illustration.

3. The *vitality and nutritive activity* of the tissues generally may be impaired, or only those of some particular part or organ, and thus general or local atrophy may result. This is in many instances the normal course of events, associated with a natural impairment or cessation of functions, as for instance in "senile atrophy," of which it is an important element, as well as in the wasting of organs or structures, such as the thymus gland, spleen, lymphatic glands, which at a certain period of life become atrophied because their functional activity is at an end. The same thing is seen in the rapid diminution in the size of the uterus after delivery. In other instances the impairment of vitality is due to some previous disease, such as inflammation. Excessive use on the one hand, or deficient exercise on the other, may produce the same effect. There can be no doubt but that if certain organs are exercised unduly they may waste, *e. g.*, the brain or testicle; while examples of the opposite condition are common enough, in the wasting of

the muscles of paralyzed limbs, of bone after amputation, or of nerves after their connection with the cerebro-spinal axis has been severed.

4. An important cause of atrophy is a *deficient supply of arterial blood*, in whatever way this may be brought about, whether by something directly interfering with its entrance into a part, or by overloading of the veins in long-continued mechanical congestion. To some extent this will explain "senile atrophy," the heart and arteries having undergone degeneration, and the circulation being thus impeded. It is in the production of "local atrophy," however, that this cause mainly acts, and any structure may be affected if the supply of blood is not adequate to the demand, provided this is not so deficient as to lead to gangrene.

5. *Direct pressure* upon an organ or tissue may occasion atrophy, partly, but not entirely, on account of the interference with the supply of blood thus brought about. The pressure of pericardial thickenings upon the heart occasionally causes atrophy of this organ, but the best illustration of this form of atrophy is that which follows the continued pressure of aneurisms and other tumors, by which bones and other structures are often extensively destroyed.

6. It has long been known that the *nerves* exercise an important influence over nutrition, and hence when any nerve is paralyzed, atrophy is liable to follow in the part which it supplies. This is partly to be attributed to the resulting cessation of functions; partly to the influence exercised on the supply of blood through the vessels; but to some extent to the direct control which nerves exert over the process of nutrition.

7. Certain *medicines*, *e. g.*, mercury, iodide and bromide of potassium, alkalies, etc., when administered for some time have the power of causing the absorption and wasting of particular organs or tissues. This power is made use of in order to promote the removal of morbid products.

8. Some forms of atrophy are met with the cause of which is at present not satisfactorily decided, *e. g.*, progressive muscular atrophy.

CHAPTER VI.

DEGENERATIONS.

STRICTLY speaking a *degeneration* is a *retrograde metamorphosis*, and implies the conversion of some tissue into one less organized than itself, which is incapable of performing satisfactorily its necessary functions. This may result either from an immediate change in the

albuminoid compounds; or from a molecular absorption of the structural elements, and their replacement by others lower in the scale. The term, however, is also applied to certain pathological processes in which a new material derived from the blood is deposited in the midst of the original elements of a tissue, which may or may not lead to their absorption, in some instances ultimately replacing them entirely. To these two kinds of so-called degeneration the terms *metamorphosis* and *infiltration* are respectively applied. These pathological changes are of the utmost importance, and they need to be severally considered in some detail.

I. FATTY DEGENERATION.

This includes *fatty metamorphosis* and *fatty infiltration*, each of which requires separate notice.

1. FATTY METAMORPHOSIS.—The fact of the direct conversion of the albuminoid constituents of tissues into fat has been established by observation and experiment, and it is a frequent pathological occurrence, being one of the natural events of decay in old age, and often leading to serious consequences. The process may take place in connection with cells or fibres. The fat is usually deposited in a granular form, but ultimately it may accumulate into masses or into drops of oil. The granules are recognized by their dark and distinct outline, refractive power upon light, and solubility in ether. Fatty metamorphosis will be best studied by taking individual tissues as illustrations.

Muscular Tissue.—Voluntary muscles may become the seat of fatty change, of which a striking example has come under my notice, in which almost the whole of the muscles of the thigh on one side were converted into fat, without any alteration in their general size or shape or in the arrangement of their fibres. The subject, an old woman, had been bedridden for several years. It is in the fibres of the heart, however, that this degeneration is most commonly observed. Under the microscope these are seen in the early stage to be somewhat dim as regards their transverse striæ, owing to the presence of a few minute fat-granules, arranged either in transverse or longitudinal lines, or in an irregular manner. Ether dissolves the fat and brings the striæ into view again. The increase in the number and size of the granules causes them to become more and more obscure, until eventually all trace of muscular fibre disappears, and its place is occupied by fat-molecules and oil-drops. Where sarcolemma exists, this may ultimately rupture and the fat be scattered about. The cells of involuntary muscular tissue are also liable to undergo fatty change, granules gradually filling them up and concealing the nucleus, complete destruction finally ensuing. The conversion of muscle into adipocere after death is a form of fatty degeneration.

Bloodvessels.—The arteries are very prone to fatty degeneration as age advances, which may start as an immediate change in the cells of the inner coat or in the muscular coat, or be associated with the condition named "atheroma." At last the tissues may be more or less destroyed and carried away by the blood current, leaving uneven erosions on the inner surface of the vessels. The capillaries are also apt to undergo a fatty change.

The *nerve-tissues*, both cells and fibres, are subject to fatty degeneration, becoming the seat of much molecular fat and finally breaking down. This is well seen in the different varieties of softening of the brain or spinal cord.

As regards fatty degeneration in cells, the following may be mentioned in further illustration. The so-called "compound inflammatory globules" or "exudation-corpuscles," as well as pus-corpuscles are merely the result of the conversion of the contents of cells, either normal to the part or which have migrated from the blood, into granular fat. A large number of these originate in cellular tissue corpuscles. In the epithelium of the renal tubes, as well as the cells of the liver, suprarenal capsules, and lymphatic glands, fatty degeneration also occurs, while the "arcus senilis" is due to the same process in the cells of the cornea. Most organs in their natural decay undergo this change, and it is further exemplified in the formation of many secretions, in the production of the corpus luteum in the ovary, and in the degenerative changes which the placenta undergoes on the approach of the full period of pregnancy. Morbid growths, such as cancer, tubercle, and various tumors, are likewise subject to fatty metamorphosis.

When cells become fatty they often enlarge and are more spherical and distended. The granules first appear at a distance from the nucleus, scattered irregularly; they then become more numerous and larger, obscure the nucleus, and finally render it quite invisible. The cell-wall is often ruptured or absorbed, leaving merely an accumulation of granular fat, which frequently separates into its constituent particles, owing to intermediate liquefaction.

Caseation, Caseous or Cheesy Degeneration.—These terms have come into considerable prominence of late years, and are used to signify the conversion of various structures into a kind of soft, dryish, cheesy-looking substance, of yellowish color. It is really a process of partial fatty degeneration with drying, and the material formed is found to consist of withered cells, fat-granules, partially saponified fat and crystals of cholesterin. Caseation generally occurs in connection with some morbid product, or where there is a great accumulation of cells pressing closely upon each other, and it is especially met with where vessels are few, so that the tissue is dry. Pulmonary phthisis affords some of the most frequent examples of caseous degeneration, but not

of necessity associated with tubercle. It is also often seen in scrofulous lymphatic glands, cancer, chronic abscesses, etc. Ultimately a more or less creamy or puriform-looking fluid substance may be produced, or a kind of fatty emulsion, which may be completely removed in various ways; or it may become encapsuled by some dense tissue and finally calcify. By some pathologists this caseous material is supposed to act as a poison, and after absorption into the blood to originate tubercle.

EFFECTS.—The changes induced by fatty degeneration are usually quite obvious if it is at all marked, but in less advanced cases the microscope can alone reveal the change. There is an alteration in color, the affected tissue becoming usually paler and assuming a yellowish or brownish tint; this is well seen in muscular tissue, but in some instances, as in softening of the brain, the color varies from white to red according to circumstances. A tendency to opacity is also evident. One of the most marked changes is a diminution in the consistence of the affected structure, which varies from a slight degree of softening, the tissue breaking down under pressure or tearing more easily than in health, to its conversion into almost a fluid pulp. All vital properties, such as elasticity or contractility, are at the same time impaired or lost, as well as the power of resistance. When the process is advanced, the affected tissues may have an oily feel, and ether will dissolve out a considerable quantity of fat.

The remote consequences are very important. The functions of any organ or tissue involved must necessarily be interfered with to a greater or less degree. Structures are also very liable to give way and rupture, as in the case of the heart and vessels. Arteries may become the seat of aneurism, and by interfering with the supply of blood to structures which depend on them for their nutrition, ultimately lead to their degeneration also.

ETIOLOGY.—Some interference with nutrition is the immediate cause of fatty degeneration, and it may occur under either of the conditions mentioned as capable of giving rise to atrophy. Those to which it is usually due are—1. Senile decay, during which most of the tissues undergo degeneration. 2. Deficient supply of arterial blood to a part, from obstruction, changes in the vessels, or external pressure. 3. Some general disease lowering vitality, such as phthisis or cancer. 4. Congestion, inflammation, very rapid development of a tissue, or excessive exercise of its functions, which disturbs its vitality. 5. Possibly the presence of an excess of fat in the blood may occasion fatty decay.

2. FATTY INFILTRATION OR GROWTH.—This is an essentially distinct process from “fatty degeneration,” there being no necessary change in the elementary structures themselves, but merely an excessive deposit of fat from the blood within the cells of the part affected, and this infiltrates the tissues to a variable extent. It might, in fact, be con-

sidered a *hypertrophy* of fat. The deposit occurs in the form of oil-drops, which ultimately run together, completely obscuring the other contents of the cells without of necessity destroying them. In course of time the tissues may degenerate from mere pressure and be finally absorbed. The best examples of this infiltration are found in the increase of ordinary adipose tissue observed in some individuals, subcutaneous as well as around internal organs; in connection with the heart; and in the cells of the liver. In the two former instances the connective-tissue cells become filled with fat. In the liver the hepatic cells become more or less loaded with drops of oil, which cause them to become larger and more spherical and hide their contents.

EFFECTS.—Fatty infiltration may occasion enlargement of organs and some alteration in form, there being a tendency to roundness of margins and general outline. The color also becomes paler and may be just that of adipose tissue. The principal changes observed are that the affected structure is softened, and has a doughy feel, such as is met with in ordinary fat; and evidences of the presence of more or less oil may be obtained, either by the finger, the knife, blotting-paper, or ether. The functions of the tissues involved are often interfered with, but not to the same extent as in fatty degeneration, provided they have not undergone this process owing to pressure.

ETIOLOGY.—1. *Excess of fat in the blood* is a common cause of this pathological change, which is often associated with obesity. This results from consumption of too much fat or of aliments which contribute to its formation; from a deficiency in the amount of exercise taken, and general luxurious habits; or from both these causes combined. There is also a diminution in the ordinary waste of fat under these circumstances.

2. In some affections attended with much emaciation, certain organs are prone to become the seat of fatty infiltration, especially the liver. This is best seen in phthisis, and is supposed to be due to the absorption of the general fat and its consequent accumulation in the blood, from which it is afterwards deposited in the liver.

3. Undoubtedly *interference with the respiratory process* may lead to fatty infiltration, because the fat is then not properly burnt up, and thus its not infrequent occurrence in lung and heart affections will be partly accounted for.

4. *Local Inactivity* may be the cause of fatty infiltration. Thus it may be observed in connection with voluntary muscles which are paralyzed or otherwise rendered inactive.

II. MINERAL OR CALCAREOUS DEGENERATION—CALCIFICATION—PETRIFICATION.

It is important to distinguish this degeneration from true ossification, with which it is often confounded. There is no conversion into bone, but merely an infiltration of the tissue involved with particles of calcareous matter. These are in the form of very minute molecules, chiefly deposited irregularly between the histological elements, but partly in their interior as well. Under the microscope they look like dark, opaque, irregular particles under transmitted light, and when aggregated have a glistening aspect. They often resemble fat in appearance, but may be distinguished by their solubility in dilute mineral acids, which is frequently attended with effervescence and the formation of small bubbles of gas, owing to the decomposition of carbonates. The deposit occurs first immediately around small vessels where these exist, but ultimately it may increase so as to form irregular patches or concretions of considerable extent. Chemically it is made up chiefly of calcic and magnesian phosphates and carbonates, but other salts are also present, and the composition is not uniform in all structures.

Calcification is particularly prone to occur in tissues which have lost their vitality, and which have previously undergone other forms of degeneration, especially the fatty. It is in fact very commonly the final stage of degenerative change, after which no further alteration can take place. Among its most frequent seats are the *arteries* and the *valves and orifices of the heart*, and it is in connection with these structures that its most injurious effects are produced. Calcareous deposit, however, is met with in many other tissues, viz., in fibrous or fibro-serous membranes, *e. g.*, the pericardium, dura mater, tunica albuginea, etc.; in the walls of hollow organs, such as the gall-bladder or stomach; in the pia mater and choroid plexuses of the brain, constituting "brainsand;" in cartilage, muscle and nerve tissues; in various organs and glands, such as the kidneys, lungs, absorbent glands, thyroid, prostate, and pineal gland; in connection with different morbid products, as tubercle, cancer, inflammatory exudations, fibrinous deposits from the blood, chronic abscesses, and tumors of all kinds.

EFFECTS.—The deposit of calcareous matter necessarily occasions hardness, stiffness, roughness, and rigidity, often combined with brittleness. There is a gritty sensation on section, and when membranes are involved they can frequently be broken up with a crackling noise. In some cases stony masses of some size are formed. Now and then a kind of chalky fluid is produced, or a substance like cement. The most injurious consequences result from the change in size and shape of structures, the roughness and interference with free movement and with the functions of elasticity and contractility, and the brittleness which attend

calcification. Thus in the case of arteries, it narrows their calibre, makes them rough and rigid, destroys their elastic and muscular tissues, and renders them liable to be easily ruptured. Hence it leads to insufficient supply of blood to parts, with consequent atrophy or gangrene; also to the formation of internal clots, or to hæmorrhage. In connection with the valves and orifices of the heart it causes serious obstruction and interference with their normal functions. In some cases, however, calcification is distinctly a favorable result, and indicates the cessation of injurious morbid processes. It is, in fact, in such instances, a practical cure, and the calcified substance may remain for many years inert, without causing any disturbance. This is well seen in connection with phthisical deposits and scrofulous lymphatic glands. A case fell under my notice some years ago, where in a highly scrofulous young man, aged 21, the whole of the glands in the abdomen were converted into calcareous masses, and had evidently been in this condition for many years without leading to any inconvenience, the patient dying from quite an independent acute illness.

ETIOLOGY.—1. Calcification is usually associated with *deficient vitality* and a *lowering of the nutritive activity*, either general, such as occurs in advanced age; or local, such as is met with in connection with morbid products, being then dependent upon an insufficient supply of blood, with slowness of its circulation. As already stated, it is frequently the termination of other atrophic and degenerative processes. With regard to the immediate cause of the deposit, it is supposed to be due partly to the inability of the tissues to take up the nutritive fluid in which the salts are dissolved; partly to the precipitation of these, because the carbonic acid which holds them in solution escapes, owing to the stagnation of the fluid.

2. Occasionally calcification is dependent upon *the presence of an excess of calcareous salts in the blood*. This may arise in connection with diseases of bones, such as mollities ossium, extensive caries or necrosis, in which their salts are rapidly absorbed, and "metastatic deposits" are afterwards formed in other parts, involving often many structures and organs. An interference with the urinary secretion may also lead to this condition, the salts not being properly eliminated, and when this happens the kidneys are particularly apt to be the seat of deposit.

III. FIBROID DEGENERATION.

Tissues are sometimes gradually changed into a tough, inelastic material, made up of imperfect fibres resembling those of fibrous tissue. There is no apparent exudation to any extent, but a hyperplasia of the cellular-tissue elements occurs. The affected part is more or less opaque, whitish, thickened, and stiff, sometimes being hard and rough. The fibro-serous and serous membranes often present this change in the form of thick-

ened patches, which are well seen in connection with the pericardium. It also affects other structures, such as the coverings of organs, as that of the spleen or liver; the sheaths of vessels; the valves, tendinous cords, and muscular tissue of the heart. The functions of the involved parts may be much impaired. Ultimately they may become calcified. This fibroid degeneration results from pressure and friction; from repeated traction; or sometimes from long-continued congestion. It is not always easy to draw a line between the effects of this process and those of chronic inflammation, and some pathologists consider that the latter always precedes and is the cause of the fibroid change.

IV. PIGMENTARY DEGENERATION—PIGMENTATION.

General or local changes of color in tissues may result from various causes. As illustrations may be mentioned the color due to jaundice or local staining by bile; the bronzed hue accompanying suprarenal disease; the color produced by the action of the intestinal gases, or of those set free in mortifying parts; and that brought out by the prolonged administration of nitrate of silver. What is at present under consideration, however, is the deposit of actual pigment in connection with various textures; and it is necessary to discuss the origin, nature, and characters of the different kinds which may be met with.

1. In the great majority of cases in which pigment is found it originates from the coloring matter of the blood, which undergoes certain changes. This coloring matter may be present in some localized part, either from its mere transudation through the coats of the vessels; from the migration of red corpuscles; from actual hæmorrhage having taken place; or from capillary stagnation. At first it is diffused and stains the tissues, especially the cells, coloring their contents, but leaving the nucleus and envelop unaffected. After awhile the color changes, assuming a variety of tints, such as yellow, yellowish-brown, brown, reddish-brown, dark-brown, gray, or black; the exact hue depends much upon the length of time the pigment has been formed, and the tissue in which it is present. At the same time it separates into minute molecules or crystals or both, which are found within or outside the cells. The molecules may aggregate into large granules; they are round or irregular in shape, well defined, opaque or sometimes glistening in appearance. The crystals are in the form of minute oblique prisms, needles, or plates, which vary in color from yellow, through red or brown, to black, and they present a shining aspect. These particles are very persistent; they resist the action of acids, and are not easily destroyed. Water, alcohol, and ether do not affect them, but they are dissolved by strong alkalies, forming a red solution, while concentrated mineral acids bring out a series of changes of color. Chemically the pigment is supposed to consist of *hæmatoidin*, but when it becomes

black it is named *melanin*. Examples of these changes in blood-pigments are frequently met with in connection with cerebral apoplexy; in pulmonary congestion or hæmorrhage; in subcutaneous extravasations; and in the formation of the "corpus luteum" in the ovary. The alterations in the color of the "rusty expectoration" of pneumonia as the disease progresses are due to the same cause. In certain affections the blood itself contains corpuscles inclosing a quantity of black pigment. This occurs in the rare disease called *melanæmia*, as well as after prolonged attacks of ague, in which the spleen becomes enlarged and contains an abundance of the same pigment, which is supposed to be absorbed into the blood. It is, however, originally derived from the blood-pigment. The same condition is observed in melanotic tumors. Occasionally the minute portal vessels of the liver become filled with black pigment.

In some instances pigment is supposed to be directly formed and secreted in certain cells, but here again the blood must be looked upon as its ultimate source. This is especially presumed to occur in growths connected with tissues which normally contain much pigment, such as the choroid coat of the eye.

2. An important source of pigmentation in connection with the lungs and bronchial glands is the inhalation of certain substances along with the air breathed. All persons are liable to inhale small particles of carbon, the product of imperfect combustion, and this occurs especially in large towns and manufacturing districts. Hence it is found that the lungs become darker as age advances. It is, however, in the lungs of those who, owing to their occupation, are exposed to the constant breathing of air containing various minute particles suspended in it, that the most marked alterations are observed. Colliers inhale fragments of coal and their lungs become ultimately perfectly black. Miners, stonemasons, and others are also subject to changes in the color of these organs from a similar cause.

The carbon or coal exists in the form of minute granules which resist all chemical change, and these after entering the small bronchi and air-cells somehow penetrate the tissues, passing into the epithelium-cells, as well as into the tissue between the lobules and around the bronchi, where they lie either free or inclosed in the connective-tissue corpuscles. They are taken up by the lymphatics and conveyed to the bronchial glands, which soon become quite black also. In the matter which is expectorated abundant pigment is seen within the cells which it contains, and the sputa may be perfectly black. The change of color in these cases is, however, not believed to be entirely due to the direct deposit of material from without, but partly to the irritation caused by this material setting up inflammation, with stagnation of blood, the pigment of which undergoes the usual alterations.

V. MUROID DEGENERATION.

Some tissues occasionally undergo a process of softening or liquefaction, to which this term is applied. They become changed into a mucilaginous substance, colorless and homogeneous, which yields *mucin*. In fact they seem to return to their original fœtal condition. The change may take place extensively or in limited spots, in which, being surrounded by healthy tissue, it may give rise to an appearance of cysts. The intercellular tissue is most affected, but sometimes the cellular elements become involved in the degeneration. This degeneration is met with in cartilage, bone, serous membranes, and in the choroid plexuses of the brain. Some tumors are of a "mucoid" structure when first formed, and many others may undergo this change more or less.

VI. COLLOID DEGENERATION.

The substance formed in this change is of a jelly or glue like consistence, glistening, transparent, and devoid of color. It is derived from the albuminoid tissues, and differs from *mucin* in that it has sulphur entering into its composition, and in not being precipitated by acetic acid. This degeneration also involves the *contents of the cells* themselves and not the *intercellular substance*.

Ultimately the colloid substance may form considerable masses from coalescence, which often appear to be contained in cystic cavities. New growths sometimes start as "colloid tumors," and other tumors are liable to the change. Formerly all "colloid tumors" were looked upon as being of a cancerous nature, but it is now recognized that non-malignant tumors may become the seat of this degeneration. Enlarged thyroid glands and lymphatic glands occasionally contain colloid material.

VII. LARDACEOUS DISEASE—ALBUMINOID INFILTRATION— AMYLOID DEGENERATION—WAXY DISEASE.

By these names among others a very important morbid condition of organs and tissues has of late years been recognized. There is yet much uncertainty about several points connected with it, but the following account may convey tolerably complete information as to the present state of knowledge on the subject.

1. CHARACTERS OF THE ALBUMINOID MATERIAL AND OBJECTIVE CHANGES IN THE TISSUES AFFECTED.—The material, the presence of which in certain tissues is characteristic of albuminoid disease, is pale, structureless, and homogeneous, and at first nearly transparent. It is not prone to decomposition, is unaffected by most reagents, but gives certain characteristic chemical reactions. When a watery solution of iodine is applied to the affected tissue a deep reddish-brown or mahog-

any color is brought out, but this is not invariable even when the disease is advanced, and it may be more useful as indicating a slight degree of the change, especially when applied to microscopic sections. The subsequent addition of a drop of strong sulphuric acid may give rise to a violet or dark-blue color, but this test, which is recommended by Virchow, is not easily obtained and is unnecessary. The morbid substance may undergo a granular or fatty degeneration, and it is also said that it tends to contract and be changed into fibrous tissue. When an organ or tissue is much affected it presents certain striking characters. The organ is enlarged, sometimes to a great degree, but without any irregularity in form, the surface being quite smooth and the margins inclined to be rounded; the weight is proportionately increased, the specific gravity is high, and the organ feels heavy, solid, and firm. It may be cut into regular fragments, quite smooth and with sharp margins, or very thin slices may easily be removed. It can also be torn into pieces, while the consistence is peculiar, being a combination of toughness and resistance with elasticity, resembling somewhat that of wax or wax and lard combined—hence the names “waxy” and “lardaceous.” A section is dryish, paler than normal, anæmic, and presents a glistening and translucent aspect, being quite smooth, uniform, homogeneous, and compact. In many instances, however, the mischief has not extended to such a degree as to alter much the general physical characters of organs; and it may be limited to the vessels or to certain spots, as is well seen in the so-called “sago-spleen,” in which the material is confined to the malpighian corpuscles. In still less advanced cases the change may only be detected by examining sections of the affected tissue under the microscope, and to these, well washed, the iodine test may be applied. The minute arteries and capillaries are almost always first involved, especially their muscular coat, and the cells of their inner coat. The walls become thickened, the channel is narrowed, and on section the vessels remain patent, while they assume a compact, translucent, shining appearance, coming to resemble silvery cords or threads. After a time the material extends to the cells and intercellular tissues, enlarging the former and making them more spherical, at the same time displacing their normal contents, the nucleus being destroyed. The cells then coalesce; and the whole structure presents finally the peculiar glistening appearance. It is supposed by some that the substance makes its way directly through the walls of the vessels and then extends into the tissues around.

2. NATURE AND ORIGIN OF THE MORBID MATERIAL.—Various theories have been held on these points. Virchow, on account of its chemical reactions, considered the substance to be allied to starch or cellulose—hence the term “amyloid;” others believed it to be a form of cholesterolin. These views have, however, been entirely disproved, and that at present commonly adopted is, that the material is of an *albuminoid*

nature, being allied to albumen and other protein elements. The results of chemical analysis show that it is a nitrogenous compound. Dr. Dickenson affirms that organs in which it exists are deficient in alkaline salts, and has advanced the view that the substance is *dealkalized fibrin*. Marcet found that the affected structures were deficient in potash and phosphoric acid, but contained excess of soda and chlorine. With regard to the *origin* of the albuminoid material, two distinct theories are held, viz., that it is the product of some *local degeneration* or *metamorphosis* of albuminous tissues; or that there is a *direct deposit* from the blood, in consequence of some alteration in this fluid, which deposit infiltrates the tissues. Nothing of the nature of this albuminoid substance has, however, been detected in the blood, and therefore the presumption is that it is modified after it escapes from the vessels. Dickenson thinks that the fibrin of the blood is deprived of its alkali, as the result of prolonged suppuration, and that it is then deposited. Dr. Grainger Stewart strongly advocates the degeneration theory, and calls attention to the distinction between the waxy degeneration proper and the secondary deposit of fibrinous material which results from it.

3. ORGANS AND TISSUES AFFECTED.—Albuminoid disease is particularly liable to affect small arteries and capillaries, cells, and involuntary muscular fibres. Any organ or tissue in the body may be implicated and usually several organs are involved at the same time. The liver, spleen, kidneys, and absorbent glands are most frequently affected, but other structures are also attacked sometimes, such as the stomach and intestines, suprarenal capsules, bones, voluntary muscles, brain and cord and their membranes, tonsils, serous membranes, heart, lungs, pancreas, uterus, and bladder; morbid deposits, *e. g.*, inflammatory exudations, tubercle, or cancer, may also present the albuminoid change. In some cases when it follows disease of bones it begins in the neighboring lymphatic glands, and this is considered as an argument in favor of its local degenerative origin. In many of the organs above mentioned the disease seems limited to the minute vessels.

4. ETIOLOGY.—This affection is almost invariably brought on by some previous disease, which in the great majority of cases is attended with *long-continued and excessive suppuration*, but the experience of many observers has proved that this is certainly not absolutely necessary, and in the worst case which ever came under my notice there had been no suppuration. The diseases with which albuminoid disease is chiefly associated are: *a.* Caries or necrosis of bones and rickets. *b.* Syphilis, especially if it has caused disease of bones with much suppuration, or if much mercury has been given. Children who are congenitally syphilitic may be the subjects of albuminoid disease. *c.* Chronic pulmonary phthisis with much purulent expectoration, as well as other lung affections attended with this symptom. *d.* Chronic empyæma. *e.* Extensive ulceration of the intestines. *f.* Prolonged ague

or exposure to malarial influence. *g.* Pyelitis and some other kidney affections.

5. **CLINICAL HISTORY.**—Only a few general remarks need be made here, as the symptoms will again be described in connection with individual organs. It is not always easy to make out what symptoms are due to the original affection, and what to the albuminoid disease. Nutrition is impaired and the patient is emaciated, often extremely so, at the same time becoming pale and anæmic, with a peculiar transparency of tissues, or presenting a waxy look. There is great debility in many cases, with a tendency to syncope. Œdema of the legs occurs from weakness and anemia. With regard to the various organs, their functions are interfered with more or less, and local symptoms are produced, while some of them are frequently obviously enlarged and present well-defined characters to physical examination.

6. **TREATMENT.**—This must be directed to the cause of the disease, by putting a stop to suppuration, etc.; at the same time that the general health is improved by *diet, hygienic measures, tonics, iron*, and other remedies indicated in different cases. The administration of the syrup of iodide of iron is certainly often attended with considerable benefit, if persevered in for some time.

SECTION III.

THE remainder of this work is chiefly devoted to the consideration of individual diseases. Much controversy has been carried on with regard to the **NOMENCLATURE** and **CLASSIFICATION** of diseases, and many systems have been proposed. The arrangement adopted in the following chapters will be mainly on the model of that recognized by the College of Physicians, most of the complaints being described according as they come under one of the groups mentioned below, though it will be expedient to deviate from this arrangement in some instances.

I. **GENERAL DISEASES.**—These affect more or less the entire system, and, though local morbid conditions are often present, they arise secondarily, as the necessary or accidental consequence of the general disorder. Under this class are included:

(A.) The various *idiopathic fevers* and certain other affections which are due to the action of a specific poison on the system introduced from without. *Ex.*, Scarlatina, small-pox, ague, etc.

(B.) *Constitutional Diseases.*—These are dependent upon some unhealthy condition of the blood or so-called *cachexia*, which, however, is usually revealed by local lesions, often developed in several parts of

the body at the same time or in succession. Many of them originate from the action of a morbid poison, either entering from without, or more commonly generated within the system, or handed down by hereditary transmission. In some of these diseases no such morbid agent can be detected. *Ex.*, Rheumatism, cancer, scurvy, etc.

II. LOCAL DISEASES.—Under this group will be described the various affections of the different organs and tissues in succession. It will be convenient to treat under this heading not only of primary *local* disorders, but also of some complaints which are more strictly of a *general* character, but which present special local manifestations.

I. GENERAL DISEASES.

A. IDIOPATHIC FEVERS.

ACUTE SPECIFIC FEVERS—ACUTE EXANTHEMATA.

BEFORE proceeding to discuss the several diseases included under the above group, it will be expedient in the present connection to consider the following subjects, viz., Fever, Contagion, and Epidemics.

CHAPTER I.

FEVER OR PYREXIA.

THE phenomena of *fever* may be observed in connection with two distinct classes of cases, viz.: First, they may follow and be the result of some local lesion in a tissue or organ, especially inflammation, when the fever is termed *secondary*, *symptomatic*, or merely *pyrexia*, *fever*, or the *pyrexial state*. The fever attending pneumonia will serve to illustrate this group. Secondly, they may constitute the chief and primary deviation from the normal state, not being due to any evident local cause, and if any special organ or tissue becomes morbidly affected, this occurs secondarily. *Idiopathic*, *essential*, *primary*, or *specific* are the terms applied to fever under these circumstances, or it is simply called a *fever*. It originates from the presence of some morbid

poison in the blood, either introduced from without or developed within the body. The acute specifics and rheumatic fever afford examples of this class.

ESSENTIAL PHENOMENA AND SYMPTOMS.—The precise symptoms which may be observed in different febrile diseases are necessarily very variable, but there are certain phenomena which are characteristic of the pyrexial condition, to whatever cause this may be due, and to these attention will now be directed. They may be arranged thus:

1. *Rise in Temperature.*—This has been generally looked upon as the only absolutely necessary sign of fever, excessive heat of the body being considered as characteristic of the febrile state. It may be evident in the aspect or sensations of the patient, or the skin may feel hot to the touch; but no reliance can be placed on these sources of information, and the existence of pyrexia must be determined by the use of the thermometer. The temperature may range from only just above the normal to 108° , 110° , or even above 112° Fahr., but it does not commonly exceed 105° or 106° . It may continue to rise for some time after death.

2. *Alterations in the Secretions.*—Pyrexia is attended with *deficient elimination of water* from the system, and at the same time with excessive destruction of tissues. Hence the secretions and excretions are as a rule *diminished in quantity*, as well as *altered in quality*, and from this result some prominent symptoms, viz.: *a. Dryness and roughness* of the skin, though this is not always observed, in some cases there being profuse perspiration. *b. Derangements of the alimentary canal.* The salivary, gastric, and intestinal secretions are deficient; hence the tongue is furred and the mouth clammy; there is much thirst, but no inclination for food, and the bowels are constipated. Nausea and vomiting are not unfrequent symptoms. *c. Changes in the urine.* This is much diminished in quantity, high-colored, very acid, with a strong odor, and of high specific gravity. It also generally exhibits other alterations, containing an excess of its organic nitrogenized constituents, especially *uric acid* and *urea*, a much larger quantity of these substances being excreted than in health during the twenty-four hours. There is also often an increase in hippuric acid, sulphates, phosphates, and coloring matters, but not always. The alkaline chlorides are commonly deficient, and may be absent altogether. Abnormal ingredients may be present, and slight albuminuria is common in febrile cases.

3. *Derangements of the Circulatory and Respiratory Systems.*—The *pulse* is increased in frequency, and may rise to 120, 140, or more, being as a rule in proportion to the temperature. A rise of 1° Fahr. is stated to be attended with an increase in the frequency of the pulse of eight beats per minute, but to this statement there are many exceptions. In its other characters the pulse varies greatly in different cases. In

long-continued or severe cases it may become very weak, irregular, or intermittent, these characters being associated with feeble action of the heart.

The *blood* is altered in composition, there being a diminution in the amount of alkalies present, and in the alkalinity of the serum; after a time the albumen and red corpuscles also become deficient, while the white corpuscles are often increased in number. In some forms of fever the proportion of fibrin is much above the normal; in others it is greatly reduced.

The *respirations* are usually increased in frequency in febrile cases; some observers affirm that they are in proportion to the pulse; others that the ratio is always disturbed, the respirations being in excess. Neither of these statements will hold good for all cases. With regard to the elimination of carbonic acid, the balance of opinion is that this is above the normal on the whole, owing to the increased frequency of breathing.

4. *Disturbance of the Nervous System.*—Symptoms referable to the nervous system usually attend the pyrexial state. In the early stage chills or rigors are often experienced, with general pains or soreness, and a sense of exhaustion, languor, and inaptitude for any occupation or effort. Some fevers present special localized pains, and headache is a very frequent complaint. Restlessness, insomnia, and slight nocturnal delirium, are common symptoms. Under certain circumstances there may be very serious nervous disturbance, indicated by great prostration; delirium, either violent or muttering; somnolence or stupor tending to coma; and muscular disorders, such as tremors, subsultus tendinum, picking at the bedclothes, or convulsions.

5. *General Symptoms.*—Owing to the undue waste of tissues, while at the same time but little food is taken to make up for the loss, and even this is assimilated with difficulty, febrile patients always lose flesh and weight more or less rapidly, and feel debilitated and depressed; in many instances they become exceedingly emaciated and greatly prostrated in a short time, the tissues being very rapidly consumed.

MODES OF TERMINATION.—Such being the nature of the symptoms associated with fever, the next point to consider is how it may terminate, supposing recovery to take place, or, in other words, how *defervescence* may be brought about? The *modes of termination* are: 1. *By Crisis.*—This mode is characterized by a sudden or rapid abatement of the fever, indicated by a marked fall in temperature, which may become normal in a few hours; at the same time there is generally a considerable increase in the various excretions, indicated by copious perspiration, a free flow of urine containing a large amount of solid ingredients, or watery diarrhoea. In some cases hæmorrhage occurs, such as epistaxis. 2. *By Lysis.*—Here there is a gradual defervescence, the temperature subsiding slowly and regularly for some days, and

there being no critical discharges. 3. *By a combination of Crisis and Lysis*.—At first a rapid fall occurs to a certain degree, this being followed by a gradual lowering of temperature; or for some days a regular alternation of high and low temperature is observed. 4. *Irregular*.—Occasionally defervescence is quite irregular in its progress. During convalescence the temperature and amount of excretions often fall below the standard.

TYPES OF FEVER.—The symptoms described as belonging to fever are very variously combined, and present a wide range as regards their severity and course. Hence certain types are recognized.

1. *Types Depending upon the Course and Mode of Progress of the Symptoms.* *a. Continued*.—This group comprehends all fevers which run a tolerably regular course, without any very marked difference in temperature at different periods of the day. It includes the acute specific fevers (small-pox, scarlatina, etc.), and most cases of inflammatory fever. In these the temperature rises more or less rapidly up to a certain point, then remains tolerably stationary for a time, and finally defervescence occurs in one of the ways already mentioned. *b. Remittent*.—Here there are marked remissions in the fever alternating with exacerbations, as indicated by the temperature and other symptoms. This variety is met with chiefly in tropical climates, but remission is also an important character of *hectic* fever. *c. Intermittent*.—This type is characterized by complete cessation of all febrile symptoms, which only come on at certain regular intervals and run through a definite course, the temperature in the meanwhile being quite normal. The different forms of *ague* afford examples. *d. Relapsing*.—In some forms of fever, after an attack of the *continued* type, defervescence and apparent recovery take place, but this is followed after some days by a *relapse*, which event may occur more than once.

2. *Types Depending upon the Severity and Combination of Symptoms.* *a. Simple*.—This form is the simplest expression of fever, presenting the characters already described, but in a mild degree. It is well exemplified in ordinary *febricula*.

b. Inflammatory.—As the term suggests, this type is the one which is usually associated with local acute inflammations, at all events at the outset. It does not, however, necessarily accompany every inflammation, nor does the fever always bear a proportion to the intensity and extent of this morbid process. It is more likely to be present when some tissues are affected than others; also in young and plethoric persons, and in those of a sanguine temperament. The symptoms are well-marked, though varying much in intensity, and they are of a sthenic character. Shivering or distinct rigors mark the onset, followed by considerable reaction. The temperature is high, the skin feeling hot and dry. There are marked pains in the limbs with much headache. Vascular excitement is high, as shown by a frequent, strong, and full

pulse. The blood contains an excess of fibrin-forming materials, and exhibits the "buffy coat." The digestive organs are much disturbed, there being a thickly furred but moist tongue, disagreeable breath, great thirst, total loss of appetite, and constipation. The urine is distinctly febrile. There is much restlessness, with sleeplessness or nocturnal delirium; occasionally, severe nervous symptoms, such as convulsions or delirium, usher in the attack, especially in children.

c. Hyperpyrexial.—Here the temperature is very high, varying from 107° to 112° or more. It shows a tendency to ascend very rapidly, being associated with most serious symptoms referable to the nervous system and lungs. *Hyperpyrexia* has been most frequently met with in cases of acute rheumatism and sunstroke, but it may occur in other febrile conditions, such as pneumonia.

d. Low Types.—Under this group may be included the following: i. *Asthenic or Adynamic.*—The patient is very weak and feels much prostrated. The temperature is only slightly raised, and the pulse is feeble and small, though accelerated. In short, febrile reaction is not prominent. At the same time there is not much thirst and the tongue continues moist. Usually cerebral symptoms are not present, but there may be nocturnal delirium. ii. *Typhoid or Ataxic.* "*The Typhoid state.*"—This presents some important distinctions from the former. The tongue tends to become dry and covered with a brown or black crust; the teeth and gums at the same time being incrustated with sordes. The heart's action is much impaired, as evidenced by the characters of its impulse and sounds; by the pulse, which is very weak and compressible, often irregular or intermittent; and by the tendency to capillary congestions in dependent parts, leading to low inflammations. Nervous symptoms are prominent, especially low muttering delirium, muscular tremblings and twitchings, and stupor ending in coma. iii. *Malignant.*—In some cases the symptoms are of such a low type, being attended with hæmorrhages and petechiæ, that they may be truly termed malignant. The terms *putrid* or *septic* are sometimes applied to fever under these circumstances. Another form of malignant fever is that in which some poison seems to act upon the system so violently as to cause the patient to succumb at once, there being no evident reaction or any local lesions. This is sometimes observed in connection with the exanthemata.

e. Hectic.—Hectic fever is usually associated with profuse suppuration, but may attend any great drain upon the system. Phthisis frequently presents it in its most typical form. It is of a distinctly intermittent or remittent type, there being exacerbations usually once in the twenty-four hours, occasionally twice. The fever sets in very gradually, at first only a slight evening rise in temperature being noticed, with quickening of the pulse; after awhile it becomes more or less constant, but a marked increase takes place toward evening,

beginning with chilliness or rigors, followed by much heat of skin, which increases up to or beyond midnight, and is succeeded by profuse sweats, so that the patient's clothes and the bedclothes become saturated. The subjective feeling of heat is very considerable, and the palms of the hands and soles of the feet have a burning sensation. The appearance of the patient is often very characteristic and striking, there being a beautiful circumscribed bright red or pink spot on each cheek, well known as the *hectic flush*. The pulse is very easily excited and made quicker; during the paroxysms it may rise to 120 or more. It varies in its characters, but is generally jerky, moderately soft, and compressible. The respirations are hurried. This fever is attended with rapid and great emaciation, and the patient feels much exhausted after each attack, becoming ultimately exceedingly feeble. The mind is unaffected until near the close of life, being often, in fact, peculiarly lively and brilliant. The duration of this variety of fever is very variable, but it tends to be prolonged.

PATHOLOGY.—The pathology of the febrile state is still a matter of much doubt and uncertainty, notwithstanding the amount of experimental investigation which has been devoted to the subject. Very conflicting views are held as to its *origin* and *nature*, and as to the explanation of the phenomena by which it is characterized. It seems clear that the condition may be set up by some morbid poison which has gained an entrance into, or been generated within the system; or in connection with some local lesion, especially of inflammatory nature. Dr. Burdon Sanderson found in his experiments that by injecting certain fluids—which he terms “pyrogenic”—in very small quantity into the circulation, fever could be excited, and these fluids either contained bacteria or the material out of which bacteria are developed. The view most commonly adopted, and probably the correct one, is, that at any rate the commencement of the febrile process results from some disturbance in connection with the nervous system, either directly induced by the morbid poison alluded to above, whatever it may be, or reflexly through irritation of the sensory nerves belonging to an inflamed part. It is believed that the sympathetic and pneumogastric nerves are particularly affected, which leads to increased cardiac action, and general vaso-motor disorder with consequent paralysis of the vessels. Some pathologists do not agree with the idea of any direct implication of the nervous system in fever, but maintain that the cause which originates this condition acts immediately upon the blood and tissues. Even in inflammation they consider that the local contamination of the blood affects the whole mass, and thus gives rise to fever.

There can be no doubt but that when pyrexia has been set up, it is attended with *destruction of tissues* in excess of what normally takes place. In health the structures of the body do not undergo rapid metamorphosis, the food yielding the elements by the decomposition of

which animal heat is sustained; but in fever the tissues become quickly destroyed and changed into various substances of lower chemical composition. This destruction involves the albuminous or nitrogenized tissues as well as the fat, and hence the muscles rapidly waste, both voluntary and involuntary, their fibres presenting an appearance of granular degeneration under the microscope; so do the nerve-centres, ganglia, and nerves; the bones become lighter; and the red blood-corpuscles are diminished in number. It is found, however, that the glandular organs do not become smaller, being indeed often enlarged from congestion, especially in young and healthy persons. This is particularly seen in the spleen, lymphatic glands, and liver, their cells also becoming enlarged and granular.

The substances into which the tissues are transformed are chiefly those produced in health, only formed now in excess, viz., urea, uric acid, carbonic acid, etc. Intermediate products of decomposition may, however, be formed, some of which probably are quite foreign to the body in a state of health. As to the place where the change occurs there is no certainty. Some consider that it is in the tissues themselves; others that the albuminous elements break down into a circulating albumen, which in the blood becomes converted into materials of lower grade, such as urea, etc.

The chemical and vital changes in the tissues and blood just described, have been usually recognized as chiefly accounting for some of the more prominent phenomena which accompany the febrile state. Beginning with the *rise in temperature*, it is well known that such destructive processes must be attended with the development of heat; while it has also been found that as a rule the temperature in cases of fever is in proportion to the rapidity and extent of these changes, especially as evidenced by the amount of the products of tissue-metamorphosis eliminated in the various excretions. In most cases *excessive excretory elimination* is observed, particularly by the urine, the quantity of urea discharged often bearing a close relation to the increase in temperature; but this is not always the case, so that the one cannot be made a measure of the other. In some instances there is little or no increased elimination during the progress of the fever. This is explained by the retention of the products of metamorphosis in the blood, owing partly to their great abundance or to their transformation being incomplete, substances being produced which the kidneys will not remove; partly to some condition of the excretory organs which interferes with their functions. In these cases it happens that *critical discharges* are most likely to occur at the termination of the fever; whilst as the result of *deficient elimination* of the substances generated serious consequences are liable to ensue. Thus, the *typhoid* type of fever is usually looked upon as resulting from their deleterious effects. The circulation of these materials through the various organs and tissues, especially the nerve-centres, is supposed to

cause the low symptoms observed in the typhoid condition. This also accounts for the *secondary inflammations* which are so liable to arise in the course of febrile cases.

The view just considered, which attributes the phenomena of fever mainly to the excessive destruction of tissues, has of late been much questioned; and, as the result of experiments on the effects upon the animal heat of making different sections of the spinal cord, as well as of observations as to what happens in cases of injury to various parts of the nerve-centres, and in certain nervous diseases, it has been attempted to be shown that the rise in temperature in pyrexia is directly connected with the nervous system in some way or other. There are conflicting statements about the effects of section of the spinal cord upon the heat of the body, and also as to what has been observed in cases of injury, some of which it is difficult to explain, but there can be no doubt that often the temperature is very much raised. A most remarkable case was recently brought before the Clinical Society by Mr. Teale of Scarborough, in which, in connection with some injury about the upper part of the spine, the temperature ranged for nine weeks between 108° to above 122° F., probably on one occasion reaching at least 125° , the patient ultimately recovering.

With regard to the modes in which the nervous system is supposed to influence the temperature, the main theories are these: The hypothesis has been advanced that there is a centre in the brain which regulates the production of heat, and that when this is excluded from performing its functions, the development of heat is augmented. For such a view, however, there is no adequate foundation. The other and more reasonable notion is, that the elevation of temperature is the result of vaso-motor disturbance. Most observers believe that the vaso-motor system is paralyzed, and that hence the vessels become dilated and an undue amount of heat is lost from the surface of the body. Senator has, on the other hand, tried to prove that there is increased irritability of the vaso-motor nerves in fevers, particularly of those supplying the arteries of the skin, and therefore the vessels contract, thus interfering with the loss of heat necessary to maintain a normal temperature.

It seems clear that the nervous system does influence the temperature of the body considerably, but in cases which are ordinarily recognized as febrile, there is still every reason to conclude that the increased heat is to be accounted for by the exaggerated tissue metamorphosis, and this is the opinion arrived at by a recent observer (Murri) as the result of his experiments. Those cases of injury or disease of the nervous centres in which the temperature is raised, appear to be of a different character. As a subsidiary cause of the increased temperature in fever, it must be remembered that the amount of perspiration partly regulates the animal heat, and this being usually more or less checked, the temperature becomes elevated.

The views of Dr. Beale on this subject deserve notice. He believes that there is a great increase in the bioplasm of the blood, bloodvessels, and tissues, and that this is the cause of the excessive heat. He further states that *insufficient oxidation* of tissues occurs, as a result of which the blood becomes loaded with noxious materials which the excretory organs cannot remove, and this condition of the blood is favorable to the growth of the bioplasm.

As already stated, the low nervous symptoms observed in certain febrile cases have been attributed mainly to non-elimination of the noxious materials resulting from destruction of tissues, and their consequent accumulation in the blood. They have, however, been also referred to the direct action of some fever poison upon the nerve-centres; to excessive heat of the blood, though this seems negatived by Mr. Teale's case; and to plugging of the minute vessels of the gray matter with white corpuscles or septic emboli.

With respect to the circulatory system, in the early stage the heart is excited, but as the febrile process advances it becomes greatly impaired in its action, for several reasons. The muscular fibres themselves undergo degeneration; the organ is supplied with impure blood; and its nervous stimulus is imperfect. As a result the alterations in the cardiac impulse and sounds and in the pulse are observed, as well as the tendency to hypostatic congestions, these being also directly contributed to probably by the abnormal condition of the vessels, tissues, and blood, and by the excessive growth of bioplasm, which tends to block up the capillaries.

Such are the main points in connection with the pathology of fever. There is no adequate explanation of another phenomenon observed, viz., *the retention of water in the system*. It has been supposed that some material forms in the blood, such as gelatin, which has a strong affinity for water, but there is no proof of this.

PROGNOSIS.—The prognosis of febrile cases must necessarily depend greatly on what the fever is due to, and will vary with each particular disease. So far as the pyrexia itself is concerned, however, there are certain conditions which always influence the gravity of the prognosis, viz., 1. *Its intensity*.—The higher the temperature the more dangerous is the case, and it becomes very serious when the temperature reaches above 107°. Under appropriate treatment, however, a considerable proportion of patients have recovered even after the temperature has risen to a much higher point than this. It must be remembered too that in certain diseases of and injuries in connection with the nervous system the heat may become very excessive and yet recovery take place. 2. *Its type*.—All low forms of fever are very grave, and any tendency towards typhoid or adynamic symptoms, especially if the nervous system is much affected, is to be looked upon with anxiety. 3. *Defective elimination*.—This is a bad sign, particularly if associated

with a very high temperature. 4. *The previous state and health of the patient.*—Young, robust, and plethoric persons are often more severely affected than those in opposite conditions. Some diseases, such as gout, increase the danger of febrile disorders considerably; while the presence of organic disease, especially of the kidneys and heart, renders them exceedingly grave.

TREATMENT.—The management of cases attended with fever is often a matter of much difficulty, and requires the most careful and constant attention. There are two rather prevalent errors which need to be guarded against. First, it must not be imagined that treatment is of no avail in febrile diseases, and that the physician has nothing whatever to do. By *judicious* interference it is possible to avert death, to relieve symptoms, and even to hasten recovery in some cases. On the other hand, *over-active* and *meddlesome* treatment is most injurious and should be decidedly deprecated, especially in the case of those specific fevers which must run a definite course. The practice of endeavoring to *cut short* fevers has unquestionably often done much harm.

There are certain general indications for the treatment of the *pyrexial condition*, which will now be briefly considered, as well as the means of carrying them out. They are as follows:

1. *To Diminish the Temperature if this tends to be Excessive.*—One of the most powerful means available for this purpose is the *external application of cold*. This acts partly by increasing the elimination by the skin, but also probably by producing some marked effect upon the nervous system and checking destruction of tissues, or, as Dr. Beale thinks, by diminishing the growth of bioplasm. The modes of applying cold are various, viz., by sponging the surface of the body with water, either tepid or cold; by cold affusion or douching, which may be practiced whilst the patient is in a warm bath; by wet packing in a sheet; by the use of cold baths; by the application of ice-bags to different parts; by injecting iced water into the rectum; or by placing the patient in a warm or tepid bath, the temperature of which is then gradually reduced by the removal of the warm and the addition of cold water or even ice, the latter being also sometimes applied to the head, spine, chest, or abdomen at the same time. After being kept in the bath for a variable time according as circumstances require, the patient is dried and removed to bed, and it may then be necessary to apply hot bottles to the feet. It is often requisite to repeat the bath even several times, and to apply ice in the intervals.

Some of the methods mentioned are not only useful in reducing temperature, but they likewise diminish the frequency of the pulse; give marked relief to low nervous symptoms; and may also have an influence upon the eruption in the case of the exanthemata, either in the way of encouraging it to come out, or of limiting its amount and im-

proving its quality. Of late attempts have been made to establish a regular hydropathic treatment of all fevers, especially on the continent. But it seems to me, for reasons stated in a paper on the subject in the *Practitioner* for January, 1875, that this has no claim to be recognized and followed as a routine method of treatment, and that there are great objections against it, especially against the more severe methods by which it is carried out. Cold or tepid sponging of the skin is the only mode applicable to ordinary cases, and this certainly ought to be practiced much more frequently than is the case at present, for it is often decidedly beneficial and affords much relief, while it is not at all dangerous if proper care is exercised. The cases, however, in which the use of external cold is so eminently servicable are those in which the temperature shows a tendency to rapid ascent, or in which it has become very high and remains so. Those treated and recorded by Dr. Wilson Fox and others prove conclusively the remarkable benefit which may be derived from the use of cold in the manner last described, when there is hyperpyrexia. Undoubtedly under similar conditions it is not only advisable to follow the same mode of treatment, but this is the *only method* which seems to offer any chance of recovery. Of course it must always be conducted under the strictest supervision, and its effects carefully watched.

Venesection has been employed with the view of lowering fever, but there is positive evidence that it acts most injuriously, and therefore should never be practiced with this object in view, although in the inflammatory variety it may be required. Among medicinal agents, *aconite*, *digitalis*, *veratrum viride*, and *antimony* are, in appropriate cases, very useful in fevers. They reduce the temperature in some degree, but have also a striking effect on the pulse, diminishing its frequency. Some of them act further on the excretory organs.

Quinine is much used for the purpose of lowering temperature or checking its ascent. It is well known that this drug has a powerful influence upon ague, and when given in considerable doses, it appears to have some power of diminishing excessive heat. Five, ten, fifteen, twenty grains, or even more are given at variable intervals, according to circumstances, and its administration may be combined with the application of cold.

Sulphurous acid, in drachm doses every two, three, or four hours, has been recommended.

2. Another important indication is to *watch the excretions*, and observe whether proper elimination is taking place. Some advocate energetic eliminatory treatment in fever, by which they propose to get rid of any morbid poison, as well as of the products of destruction of tissues. This, however, is not advisable as a general thing, except in so far as it may be necessary to keep the bowels freely open, and to give some mild diaphoretics and diuretics; but it is requisite in severe

cases to examine the excretions, especially the urine, and ascertain if the materials formed are being properly removed, and if they are not, to adopt measures which will aid their discharge. Should symptoms arise indicating that the system is being poisoned by the accumulation of the products of tissue-change in the blood, energetic eliminatory treatment is decidedly called for. This consists in measures which promote the free action of the skin, bowels, and kidneys. Diaphoretics and diuretics are very useful, such as saline mixtures containing citrate of potash or ammonia or liquor ammoniæ acetatis, along with the free use of diluent drinks. The new drug—Jaborandi—will probably be found valuable in some febrile diseases, on account of its diaphoretic action. The employment of baths as already described also increases the skin action. In severe cases, should the urine be deficient it is desirable to endeavor to excite the kidneys into activity by applying hot fomentations, linseed-meal poultices, or sinapisms, over the loins, or by means of dry cupping. Purgatives must be employed with caution, as they are likely to weaken the patient, but they are often required, and the saline aperients are the most efficient in these cases. When diarrhœa is present, some advocate that it should be permitted to continue or even be aided by medicines, as this is a natural mode of elimination of a poison. It certainly is not always well to check this symptom, but if it is excessive and the patient is becoming evidently weakened, it is, in my opinion, decidedly advisable to restrain it by appropriate remedies.

3. One of the most necessary and difficult parts of the treatment in many cases of fever is the *administration of proper diet*, including food and alcoholic stimulants, *in a proper manner*. The food must be nutritious and at the same time capable of easy assimilation. Milk is a most valuable article of diet, as well as beef tea, chicken-broth, eggs, etc. A most important matter which it is often necessary to attend to is to give the food at *frequent and regular intervals*, in *definite and moderate quantities*, and a patient should not be allowed to sleep for too long a time and thus be deprived of the requisite nutriment. It is quite impossible to lay down any definite rules, as each case must be treated on its own merits. In the low forms of fever large quantities of nutriment are called for.

With regard to *alcoholic stimulants*, these are by no means always required and their indiscriminate use may do a great deal of harm, but in a large number of cases they are very valuable, though much experience is necessary in order to determine what form to give, and what quantity, under different circumstances. Therefore young practitioners should be particularly cautious as to how they employ them, and should watch their effects very closely. Wine or brandy generally answers best, of which it may be necessary to give very large quantities, and it is astonishing how much may be taken in certain cases without producing the ordinary intoxicating effects of alcohol. It is most important

that stimulants should be administered at *regular intervals* and in *definite doses*. The essential value of alcohol consists, not in its making up for food, which must be given at the same time, but in that it maintains the action of the heart while the system is struggling against the fever; hence the chief indication for its use is to be found in the condition of this organ, as shown by its impulse and sounds; by the state of the pulse, as regards its frequency, force, and amount of tone; and by the condition of the capillary circulation. Other organs, however, must not be overlooked, and in judging of the effects of the administration of stimulants, attention must be paid as well to the tongue, skin, respiratory organs, and nervous system. Their good effects are seen in the tongue becoming moist and less furred, the skin perspiring, the temperature reduced, the number of respirations diminished, and the nervous system calmed. If the tongue becomes dry and baked, the skin burning and non-perspiring, the respirations hurried, and the nervous system excited, alcohol is doing harm. With regard to its influence on temperature, it is proved only to lower this directly when given in large quantities, and then only to a slight degree. My own experience has convinced me that in hyperpyrexial cases it is requisite to be exceedingly careful in the administration of alcoholic stimulants, and that they ought not to be poured into the system in a reckless manner, with the view of lowering temperature.

It is in the later stages of fever that alcohol is most useful, and especially when it tends towards an asthenic or adynamic type. No case, however, should be allowed to sink into a low condition for the want of stimulants, as it may then be very difficult or impossible to revive the patient. If there is any probability of this event taking place they should be employed from the first. At the same time it is very important in these cases to watch thoroughly, and to observe at frequent intervals the effects of the administration of stimulants, lest they should be pushed too far. This may be judged of partly by the smell of the breath. They must be given with particular caution if the urine is very deficient or contains albumen. As to the quantity required, this will vary much in different cases. Usually from a teaspoonful to a tablespoonful of brandy will be needed at intervals of from three hours to half an hour. Old people require a great deal as a rule, and young children bear stimulants well. Wine or brandy may be conveniently given beaten up with eggs, the *Mist. sp. vin. gallici* being an excellent preparation, or along with beef tea.

Dr. Beale has arrived at the following conclusions respecting the good effects of alcohol in cases of fever and inflammation: 1. By its *direct* action on the nerves of the stomach it immediately stimulates the heart's action, and thus promotes the capillary circulation. 2. After absorption into the blood it alters the consistence and chemical properties of fluids and solids, and cuts short the life of rapidly growing bioplasm,

or causes it to live more slowly. It reduces the permeating tendency of blood-serum; renders the walls of the vessels less permeable to fluids; checks the disintegration of blood-corpuscles; interferes with or modifies chemical changes; and has a direct action upon the particles of naked and living bioplasm.

4. Attention to *hygienic conditions* is another point of much importance in connection with fever. This matter will be again specially considered, but in the meantime it may be stated that two of the most essential requisites are *free ventilation*, so as to get plenty of fresh air and to remove that which is vitiated; and *cleanliness*. Rest of the body and mental quietude are also most important elements in the treatment of many febrile cases. Patients should not be disturbed by the presence of friends or others who are not required in the sick-room. Of course *competent nursing* ought to be specially provided, and the nurse should wear dresses which do not rustle, and to which, in the case of contagious fevers, the contagious poison will not readily adhere.

5. Many *symptoms* arise in the course of febrile diseases which require special treatment, and in order to avoid repetition it may be useful to consider here the more common of these in some detail.

Symptoms referable to the digestive organs are often troublesome. *Thirst* is almost always complained of more or less. For its relief the following drinks will be found agreeable in different cases, viz., simple iced water; barley-water; toast and water; milk with soda-water-iced; solution of chlorate of potash (3j to Oj), which may be flavored according to taste; some acid drink, such as lemonade made with the juice of lemons, or a drink composed of 3j of dilute hydrochloric acid with Oj of water or barley-water and a little honey or sugar; tamarind-water; iced champagne and seltzer-water in small quantities, if stimulants are indicated. The frequent sucking of small fragments of ice will generally be found of much service. Patients may also in most cases be allowed to suck juicy fruits in moderation, such as grapes or oranges. It is often necessary to give instructions to the nurse to cleanse the mouth from time to time. *Vomiting* is not uncommonly a symptom needing attention. Many practitioners adopt the plan of giving an emetic at the commencement of any febrile attack, but the advantages of this routine method of treatment are by no means obvious. If, however, vomiting or an inclination to vomit seems to be due to something irritating in the stomach, an emetic is useful, such as a full dose of vin. ipecac. or sulphate of zinc, followed by plenty of lukewarm water. In order to check vomiting special care must be taken as regards food, and it will be well to give nothing, if this symptom is troublesome, except very small quantities of iced milk with lime-water or soda-water at frequent intervals; or a teaspoonful of brandy with the same quantity of strong beef tea or beef-juice. Iced champagne with seltzer-water in small doses is also very serviceable, as well as the sucking of ice. With regard to medi-

nal remedies, the most efficacious in febrile conditions are effervescent draughts with 3 or 4 minims of hydrocyanic acid; or the latter with a little mucilage or bismuth. If opium or morphia is admissible, it is useful in some cases to add 3 to 5 minims of tincture of opium or solution of morphia to each effervescent draught. When the sickness resists the ordinary remedies, minute doses of strychnia sometimes have a remarkable effect in checking it. Local applications over the epigastrium are also serviceable in obstinate cases, viz., linseed-meal poultices, sinapisms, flying blisters, or cold by means of the ice-bag. Care must be taken that the tendency to vomiting is not kept up by anything wrong in the sick-room, such as bad smells or deficient ventilation.

The bowels very often require to be regulated. In most cases *constipation* is the symptom which it is necessary to treat. For this the best remedies are the ordinary black draught; sulphate and carbonate of magnesia with peppermint-water; seidlitz powders; castor oil; or, for children, rhubarb and magnesia. Under some circumstances more powerful purgatives are required. *Diarrhœa* sometimes needs to be checked, but it must be borne in mind that this may be a mode of elimination and it should not be heedlessly interfered with. It may be generally stopped, if necessary, by the ordinary remedies in different combinations, such as opium in the form of pill, tincture or enema; bismuth, chalk mixture; tincture of catechu; mineral acids; Dover's or compound kino powder, etc.

Head symptoms are among the most common needing attention in acute febrile diseases. If *headache* is severe or persistent it is desirable to apply some cold lotion or an ice-bag to the head or nape of the neck, or to employ cold or warm effusion, the latter being best for old and feeble patients. It is often advisable to cut the hair very short or even to shave the scalp. Dry cupping over the nape of the neck is also serviceable in some cases, and if the patient is young and robust it may be useful to apply two or three leeches over the temples. Similar treatment is indicated should there be active or violent *delirium*, and this symptom is often much relieved by freely douching the head with water, either cold or warm. Small blisters to the temples or nape of the neck are also beneficial in some cases. Low delirium generally calls for stimulants.

Sleeplessness is a very important symptom to treat, and demands great attention. Patients often suffer seriously from want of sleep, and I believe very injurious consequences sometimes result in fevers from a needless dread of giving narcotics. *Opium* and *morphia* are the chief remedies of this class, and it is best to give either of them in the liquid form in a tolerably full dose. If there is much throbbing headache or active delirium it is recommended to combine the opium with a small dose of tartar emetic or with ipecacuanha, Dover's powder forming a useful compound in which the latter is contained, and I have

frequently found it act very beneficially. Should there be a tendency to low delirium the opium may be given along with stimulants. This drug is contraindicated if the lungs are involved to any extent, and the respiratory functions much interfered with; if the kidneys are affected; if there is any tendency to stupor; or if the pupils are much contracted. Other useful medicines for procuring sleep, which some employ in preference, are hydrate of chloral in doses of 15 to 30 grains or more; bromide of potassium; tincture of hyoscyamus, from 50 to 80 minims; tincture of belladonna; chloroform; and nepenthe. General *restlessness* and *irritability* is frequently much relieved by sponging the skin, or in some cases it is desirable to put the patient into a warm bath. If the sense of hearing is unpleasantly acute, it is useful to put a little cotton-wool into the ears. Any tendency to *stupor* or *coma* must be combated by free douching of the head; blistering the nape of the neck; applying sinapisms or turpentine fomentations to the legs and chest; and giving diffusible stimulants internally, with strong coffee. In extreme cases much benefit has followed the application of a blister to the shaven scalp. It must be remembered that nervous symptoms may be dependent upon retention of deleterious materials in the system, and when such is the case their removal must be promoted by acting freely on the excretory organs.

Measures directed against the *typhoid state* are very often called for in the course of febrile diseases. As already stated, alcoholic stimulants and abundant nourishing food are demanded under such circumstances, and it is extremely important that these should be administered at frequent intervals, strict directions being given that the patient should not be allowed to sleep for too long a time, and thus be deprived of the necessary support. In addition to these remedies, certain medicines are very useful in adynamic cases, viz., ammonia with decoction of bark, quinine in full doses, mineral acids, sulphuric or chloric ether, chloroform, camphor, musk, etc. At the same time sinapisms may be applied over different parts. When there is great depression, strong coffee and phosphorus have been found serviceable. If patients cannot be made to swallow easily, recourse must be had to enemata, by means of which food and stimulants as well as medicines may be administered. It is important in these cases to look to the bladder and to see that it is properly emptied.

6. In acute fevers it is requisite to watch for and guard against local complications as far as possible and to treat them as they arise. It is especially needful to look to the state of the lungs, as these organs are very liable to become the seat of hypostatic congestion or inflammation. Position will have some influence in preventing this, the patient not being allowed to lie with the head too low, change of posture from time to time being also encouraged. It is further advisable to promote cough and expectoration occasionally, so as to avoid any accumulation

of mucus in the bronchial tubes. Inflammations arising in the course of fevers do not contraindicate the use of stimulants, provided they are otherwise called for. Indeed, not uncommonly they indicate a necessity for more of these remedies. Particular attention should be directed to the prevention of bed-sores, as they are very prone to occur. The parts upon which the patient lies must be examined frequently, and kept dry and clean; should there be any signs of irritation, a water-pillow or bed ought to be employed, and the parts washed over with spirit and water.

7. Great care is usually required during convalescence from fevers, as regards diet, hygiene, and medicinal treatment. Tonics and remedies for promoting digestion are very beneficial as a rule. Undue muscular exertion and fatigue must be avoided for some time. Change of air is often attended with marked benefit, and hastens convalescence considerably.

CHAPTER II.

ON CONTAGION AND EPIDEMICS.

I. CONTAGION.

THIS is the most convenient place for entering upon a brief discussion of the main facts and theories associated with this most important subject, because though it has to do with some other maladies, its chief interest is connected with the acute specific fevers. Using the word in its general sense, a "contagious disease" may be defined as "a disease which is capable of being transmitted from one animal to another, either of the same or some other species." The agent by which it is so transmitted is the *contagium*.

1. *Origin and Source of Contagion; Conditions under which it Exists; and Modes of Propagation.*—It is needless to discuss what was the primary origin of the various contagious poisons, and whether they are capable of being developed *de novo* at the present time. Probably a few of the contagious diseases are thus generated, but the majority of these affections which have to be dealt with are communicated from one human being to another, while some are transmitted from some other animal to man, *e. g.*, vaccinia, hydrophobia, glanders, malignant pustule, etc. In some cases the latter can be retransmitted to the same or another animal, usually in a modified form. It has been suggested that possibly the contagious poison may occasionally be derived from plants.

The contagium exists under different forms, and is given off in different ways. There is one distinct class of affections in which it is asso-

ciated with obvious parasitic animals or plants or their germs, *e. g.*, scabies and the various forms of tinea. In other cases it is believed to be connected with organized cells, such as those of tubercle or cancer. Not unfrequently the poison is conveyed by means of pus or other materials, derived from an inflamed or ulcerated surface or from pustules. Gonorrhœa, syphilis, small-pox, glanders, and puerperal peritonitis afford illustrations of this. It may exist also in the contents of papules or vesicles, and in the substance of the dried scab which succeeds a pustule, as in the case of small-pox. Many contagious poisons have no palpable existence, but are given off in the various exhalations and excretions of the body, but especially in those emanating from the lungs and skin. Some are supposed to exist in the breath alone, such as that of hooping-cough; others seem to be present in all the exhalations, as well as in the various secretions, *e. g.*, that of small-pox. The poison of scarlatina is very abundant in connection with the epithelium of the skin which is shed in this disease. Cholera and typhoid fever are believed to be communicated only through the fæces, which can impart specific characters to any excrement with which they are mixed. Hydrophobia is an instance of a contagious malady only transmissible through a special secretion, viz., the saliva. It has been said that malignant pustule may arise from eating the flesh of an animal affected with this disease. The blood may be the channel by which a contagious poison is directly conveyed. It is important to remember also that the emanations from the body of a person who has died of an infectious disease may give rise to the same disorder in another individual, and this may continue for some time after death.

The next point to consider is, how the contagium may be transmitted from one animal or individual to another, and how it gains access into the system? In some cases it is necessary to bring the material in which the poison resides into close and intimate relationship with the minute vessels of the tissues, so that immediate absorption may take place. This is artificially carried out by *inoculation*, *i. e.*, by puncturing the skin or otherwise destroying its superficial portion, and introducing the material into the subcutaneous areolar tissue. It may be absorbed, however, through any abrasion or ulcer, either on the skin or a mucous surface. Hydrophobia, syphilis, and vaccinia are examples of diseases which can only be propagated in this way.

Another mode of communication is by *direct contact*, without any breach of continuity of the surface. This has been especially termed transmission by *contagion*, but it is not advisable thus to limit the use of this word. It is particularly through mucous membranes that contagious poisons enter the system in this way, as is well illustrated by gonorrhœa and purulent ophthalmia. Parasitic diseases are propagated by contact, *e. g.*, scabies; and it is stated that malignant pustule may arise in consequence of the matter soaking through the skin.

Many contagious affections can be conveyed from one individual to another without the necessity of any immediate contact between them. The contagium is given off into the surrounding atmosphere, and thus passes to the unaffected person, being then inhaled or swallowed or absorbed by the skin. To this mode of communication many would limit the application of the word *infection*. The poison may also get into the food, such as milk, and be thus taken into the system. Further, the contagious elements often become attached to what are termed "fomites," viz., articles of clothing, especially those of a woollen, silken, or cotton fabric; bedding and bedclothes; hair and various other articles, and are thus propagated. They may retain their activity under these circumstances for long periods, and in this way be the means of originating their several diseases after considerable intervals, though they tend to become weakened by time. Persons passing between the sick and healthy often carry a contagious disease to the latter. A contagious poison may also be conveyed by clothes sent to be washed or sent home from an infected school, by letters, cabs, and numerous other agencies. It frequently becomes attached to furniture or the floor and walls of rooms, and thus infection may arise after an indefinite interval, if the apartments have not been properly disinfected.

Flies and other insects are believed to be the means of disseminating contagious diseases in some instances, by alighting first on diseased and then on healthy individuals. Drinking-water is a most dangerous medium for conveying the poison of cholera and typhoid fever, in consequence of the excreta finding their way into it.

Some contagious maladies may be communicated by all the modes just considered, others only through one of them, as will be pointed out when treating of these affections individually. The opinion has been expressed that they are all inoculable if the necessary conditions could be ascertained, but there is no proof of this.

After it has reached a person the contagious poison attaches itself to the skin, as well as to the mucous membrane of the mouth, nose, throat, respiratory passages, alimentary canal, etc., and may even find its way into the air-cells of the lungs. It then passes through the thin membranes, or becomes imbedded in the thick mucous tissue, through which it gradually finds its way, or it penetrates the little chinks between the epithelium cells of the skin. Thus it reaches the minute capillaries and lymphatics, into which it enters and is then carried through the system. Absorption is promoted by a swollen, soft, and moist state of the skin, or by a weak, distended condition of the capillaries; it is especially facilitated by the presence of wounds or abrasions, and by such a condition as that of the interior of the uterus after delivery (Beale).

2. *Degrees of Contagiousness of Different Diseases and Modifying Influences.*—There are marked differences with regard to the facility

and certainty of transmission of contagious diseases. Some, such as small-pox, are very readily communicated; others, such as typhoid fever, are uncertain. Many modifying influences are also at work. The probability of a contagious disease being communicated is as a rule in proportion to the quantity and strength of the poison which reaches the system, but it must be remembered that in many instances a very minute quantity is sufficient. The virulence of the contagium also varies often at different periods in the course of a malady or of an epidemic. The *mode of application* has considerable influence, inoculation being obviously the most certain. It is believed that a contagium becomes weakened by passing through several persons. If any fluid containing a contagious poison is much diluted, there is less chance of successful inoculation. From experiments made with the lymph of small-pox, etc., it would appear that by allowing certain liquid materials which contain contagious particles to stand for some time, the latter subside to the bottom, so that the upper layer of fluid may be inoculated without producing any effect. By thorough filtration also the particles may be separated. This proves that the liquid portion has no power in transmitting the contagium, but that the latter resides in the separated particles. Much will depend frequently on the temperament, constitution, state of health, and previous habits of the individual to whom the contagium is applied, as to whether the disease will be transmitted or not. A previous attack of a contagious malady usually protects against a second, but not invariably, though when a second attack is observed it is generally of a mild character. Syphilis cannot be produced by inoculation after this has been done a certain number of times. It is uncommon but not impossible for two infectious diseases to be present in the same person at the same time, and, if such an event occurs, they generally modify one another; in some instances one exercises a protective influence against another, either temporarily or permanently, or modifies it greatly, as is well exemplified in the relation between small-pox and cow-pox. Some individuals seem quite insusceptible to certain infectious disorders, without any apparent reason for this. In such cases it has been suggested that the disease has occurred during intrauterine life.

External conditions have a very important influence. Unfavorable hygienic circumstances undoubtedly increase the virulence of contagious poisons. It is believed that water intensifies the virulence of the contagium of typhoid fever and cholera. Climate and season have a considerable modifying effect, some diseases requiring a high temperature for their development, others being checked by much heat. The direct application of great heat or extreme cold, as well as of certain chemical agents, is of the highest importance in destroying contagious poisons and rendering them inert, as upon this depends, in a great measure, the power which is possessed of checking the spread of the

diseases originated by them. Among the most active chemical substances are chlorine, iodine, hypochlorite of lime, chloride of zinc, sulphurous acid and sulphites, creosote, carbolic and cresylic acids, Condyl's fluid, and chloralum.

3. *Nature of Contagion.*—There are certain contagious affections which are evidently dependent upon definite parasitic plants or animals, and in each individual disease of this class the particular animal or plant which originates it obviously constitutes its contagious element. With regard to the ordinary infectious diseases, it is assumed that in connection with each of them there is a "specific morbid agent or poison, capable of exciting and propagating this one disease and no other, and without the action of which upon the system it cannot possibly arise." This has been variously named a *contagium*, *virus*, *zyme*, or *ferment*. The nature and mode of action of contagia are questions which are warmly disputed at the present time, and towards the elucidation of which most important and interesting researches are being carried on. The discussion held at the Pathological Society during the last session, on the "Germ Theory of Disease," which was introduced by a very able paper by Dr. Charlton Bastian, served to bring out the principal views entertained on this subject, and an endeavor will be made to incorporate these in the following remarks.

Some contagious diseases, and especially infective forms of inflammation, are associated with distinct morbid products, such as pus. It is commonly believed that in these affections the contagium is something distinct from these morbid materials, and that they only form a vehicle for its transmission, but several high authorities maintain, and this was the view advocated by Mr. Hutchinson in the discussion, that in the contagious inflammations the inflammatory products are themselves the means of contagion.

Putting out of the question the idea which some hold, that a contagium is a something—a subtle entity—which it will ever be impossible to separate or to distinguish, the theories which are at all worthy of consideration, and between which the main argument at present lies, may be classed as: 1. Chemical or physico-chemical. 2. Vital or germ theories. Under the former, two chief views deserve to be mentioned, viz., that the contagium in each case is a specific chemical compound, probably of an organic nature, and either solid, liquid, or in the form of a volatile gas; or that it is albuminoid matter in a state of rapid chemical and physical change—in short, mere decomposing organic matter. The germ theory has been received with much favor, but many eminent investigators strenuously oppose it, and amongst these Dr. Bastian stands prominently forward, while others are very dubious and will not give any definite opinion on the subject. According to this hypothesis, it is affirmed that all contagious diseases arise from the action of *living germs*, which are specifically distinct from each

other in the several individual affections. There is by no means an agreement in the opinions held as to the character of these supposed germs, or as to the precise mode in which they exercise their injurious influence. Those who adopt the germ-theory generally believe that they are *living microscopic parasites or their germs*, which may either belong to the vegetable kingdom, such as minute fungi; or to the animal kingdom, including living objects variously described as bacteria, vibrios, micrococci, microzymes, zooglæa, etc. With respect to the part which these organisms play in the propagation and development of contagious maladies, it is usually supposed that they themselves constitute *the contagium*, and that "their powers of producing disease are due to their organic development." Dr. Burdon Sanderson has suggested "that they may serve as carriers of infection from diseased to healthy parts, or from diseased to healthy individuals, and yet be utterly devoid of any power of themselves originating the contagium they convey." Prof. Lister has advanced the view "that the lower fungi and their relations bacteria, may contain in themselves some chemical compound absolutely peculiar to them, and forming part of their substance, which may act upon albuminous compounds after the manner of a ferment."

Dr. Beale entertains a very distinct germ-theory from that just considered. He maintains that the germs are not parasites, but that they are extremely minute particles, of *living germinal matter or bioplasm*, which present no differences in appearance in different diseases, even under the highest powers of the microscope, but have an essential difference in vital power. He says "a disease-germ is probably a particle of living matter, derived by direct descent from the living matter of man's organism." Dr. MacLagan, in the discussion at the Pathological Society, while advocating the germ-theory, gave it as his opinion that "the organisms which produce the phenomena of disease are not those which we see and describe as bacteria, but other and much more minute organisms." He added, "I think, indeed, it is still an open question whether true disease-germs have ever been seen. Of their existence we judge by the phenomena to which they give rise."

The arguments upon which the commonly accepted germ-doctrine mainly rests are that this doctrine explains more satisfactorily than any other the phenomena which contagious diseases present, the multiplication of contagium within the body, as well as its power of retaining its vitality for long periods and resisting destructive influences; and on the fact that tissues which are the seat of infective inflammations are filled with bacteria, while definite and specific organisms have also been found in connection with certain contagious disorders, viz., by Dr. Klein in the pustules of sheep-pox (which is identical with small-pox), and in the intestinal lesions accompanying typhoid fever; in the vesicles of vaccinia; and in the blood in cases of relapsing fever. Fungoid growths have also been described in connection with cholera, but Drs. Lewis and Cunning-

ham have failed to discover any such organisms after the most careful and searching investigations. The bacteria present in inflamed tissues are, however, considered by Bastian and those who agree with him, not as the cause of the morbid process, but as pathological products, being developed from pre-existing germs, the tissues undergoing a bacterial degeneration.

4. *Effects of the Action of the Contagium upon the System, and the Changes it Undergoes.*—The effects may be entirely local and superficial, as in the case of scabies, and probably gonorrhœa; or they are at first local, but subsequently become general or constitutional, *e. g.*, syphilis. As a rule, however, the primary action of the morbid principle is on the general system, and this is usually followed by local lesions. At present attention will only be directed to this last course of events, as connected more particularly with the specific fevers.

When the poison of a "specific fever" enters the system it is generally believed to produce some primary change in the blood, but some think that it acts first on the nervous system. The blood becomes soon altered in its physical and chemical characters, its fibrin being especially diminished. It is a favorite notion that a fermentative or *zymotic* process is set up, and that there is an analogy between ordinary fermentation and the mode of action of contagia. This supposed analogy, and the belief that fermentation is invariably associated with the growth of low organisms, which, however, recent researches seem to contradict, laid the foundation for the germ-theory as applied to contagious disorders. Bastian rejects the idea of any such analogy, and maintains that the action of a contagium is merely a chemical or physical one upon the blood and tissues.

After a contagium enters the system it undergoes rapid increase, and those who adopt the germ-theory assume that it is capable of self-multiplication, the germs multiplying probably at the expense of the albuminous elements of the blood, walls of the vessels, and tissues, so that the minutest quantity of a contagious poison introduced into the body may generate an enormous amount of the same. There is no adequate proof of this, however, and all that can be said is, in the words of Dr. Murchison, that the "poison is multiplied." At first there is no evident sign of the action of the contagium upon the system, but a *period of incubation* ensues, differing in duration in different diseases, but having tolerably defined limits in each several malady. This incubation period is generally considered as lasting from the time of entrance of the contagium into the system until the first onset of definite symptoms, there being in the meantime either no symptoms at all, or none of any distinct character. It may be very prolonged, as in the case of hydrophobia, which may remain dormant for many months certainly. In the case of the *eruptive fevers*, however, Dr. W. Squire and others reckon this period as terminating with the appearance of the eruption, but it

will be more convenient in this work to follow the definition given above. The action of the contagious poison, when it originates a *fever*, is first indicated by more or less severe *general symptoms* of a *pyrexial* character, the onset of which is usually well marked by rigors, etc. Frequently there are local symptoms in addition. The contagium may act so violently upon the system, and its increase may be so rapid as to cause death at this time, without the production of any evident structural lesion. If this event does not happen, the local manifestation of the disease becomes developed after a certain time, which may be limited to one tissue or organ, or be observed in several parts, and this constitutes its *anatomical characters*. The various eruptions met with in the contagious fevers constitute very important local manifestations of these affections. The lesions are indicated by local symptoms, but they often aggravate the constitutional disturbance as well. After a certain period has elapsed the symptoms subside, and if there has been fever, *defervescence* follows according to one of the methods already described. The poison ceases to increase and is finally expelled altogether out of the system. Permanent structural changes may or may not remain.

It is important to observe that in each of these diseases there is a considerable regularity and uniformity, not only in the *course* the various stages above describe, but also in their *duration*, and therefore in that of the entire affection from first to last, and it is very necessary to be acquainted with this *natural history* of the several maladies. *Complications* and *sequelæ* are, however, very liable to arise, which interfere with the natural progress. Great variety is also observed as regards the intensity of these diseases. In some instances they are very mild; in others they assume a typhoid or malignant type, and are extremely fatal. This difference is sometimes seen running through epidemics.

5. *Elimination of Contagious Poisons*.—As has been already stated the contagium ceases to multiply after a time, and it passes out of the system, this also occurring during the entire course of the malady in many instances. The main theories as to how this removal is effected are, *a*. That the living particles make their own way out of the vessels and through the tissues, and thus reach the surface. *b*. That they are conveyed outwards suspended in the fluid which transudes from the small vessels. *c*. That the poison is directly eliminated by the agency of epithelial and secreting cells, especially those of the skin, kidneys, and intestines. According to this idea the cells attract and separate the virus, and are then cast off, being replaced by new ones. Those who believe in this theory look upon the eruptions, epithelial desquamation, diarrhœa, etc., as *efforts of nature to eliminate the poison*, and on this they found a special treatment, by which they propose to assist nature in this eliminatory process. There are strong objections, how-

ever, to this view. Beale argues not only that the cells have no eliminatory power, but that the poison actually destroys them, and that this is the cause of the shedding of epithelium which is observed after some of the contagious diseases, such as scarlet fever.

II. ON EPIDEMICS.

Diseases are divided into three classes, according to the manner in which they are disseminated among the population, viz.: 1. *Sporadic*, or those which occur in an isolated and scattered manner, and do not attack large numbers of people at the same time, *e. g.*, bronchitis. 2. *Endemic*, or those which are peculiar to certain districts, or which are constantly prevalent in these districts to a greater or less extent, *e. g.*, ague. 3. *Epidemic*, or those which suddenly attack large numbers of people, and spread rapidly amongst them, often causing great devastation; this occurring at irregular intervals, *e. g.*, cholera. These three classes, however, are not absolutely distinct. Sporadic cases of epidemic diseases are common enough, and these are frequently endemic in a district; for instance, typhus fever generally prevails in the filthy quarters of large towns. The terms *zymotic* and *miasmatic* are in common use to designate certain diseases. *Miasmatic* is a term applied to the *specific fevers*. The word *zymotic* does not imply any fermentation-theory of disease, but is now made to include all epidemic, endemic, and contagious maladies which are capable of being prevented by attention to hygienic and other conditions.

Attention will now be directed to the subject of *epidemics*. They are supposed to be caused by some *epidemic influence*, the nature of which is in most cases quite unknown. An epidemic may sometimes be distinctly traced to the influence of contagion, aided by unfavorable hygienic conditions, or to some other obvious cause, such as famine, but in most instances its origin cannot be thus definitely fixed. Certain diseases occur as epidemics which probably are not infectious, *e. g.*, influenza. Various theories have been suggested to explain the occurrence of epidemics under these circumstances. The *epidemic influence* or *constitution* has been supposed to reside in the atmosphere around us, and to depend upon the influence of the heavenly bodies; upon gases emitted in connection with volcanoes and earthquakes; upon the electrical condition of the air; upon the quantity of ozone in it; or upon the rapid development and migration of microscopic animalcules. All these, however, are mere hypotheses. When an epidemic of a contagious disease arises as the result of evident anti-hygienic conditions or from some other obvious cause, it is believed either that the specific poison is increased in quantity or rendered more virulent; or that the constitution of individuals becomes so altered as to make them more amenable to its influence and less able to resist it.

The chief facts observed in connection with epidemics may be stated under the following laws: 1. Epidemic influence chiefly affects those diseases which are infectious, rendering them more prevalent and more dangerous; or malarial diseases, *i. e.*, those due to a poison originating in the decomposition of vegetable matter. As a rule only one of these is epidemic at the same time, but sometimes there seems to be a tendency to the prevalence of several of the acute specific diseases together. Occasionally other maladies appear to assume an epidemic character; and now and then an entirely new disease makes its appearance in this way. Sometimes it is only the type of the ordinary diseases which is influenced, or there is a tendency to the implication of special organs. 2. The prevalent epidemic affects more or less the characters of other diseases. This is well illustrated in the case of cholera and influenza, choleraic diarrhœa being very common during the occurrence of the former, catarrhal affections during the existence of the latter. 3. The *extent* of an epidemic varies much. If this is very wide, the disease usually attacks different places in succession, becoming milder in one region as it invades another. It may be confined to a certain district, being then usually due to some evident local cause. 4. The *progress* is also subject to variations. Generally it is regularly onward in a definite direction, and in this way an epidemic may make the circuit of the globe. It may advance very rapidly or exceedingly slowly and gradually. Sometimes an epidemic seems to leave a place and then return, as if falling back upon itself; or it passes over special regions without affecting them; or it goes out of its course in a lateral direction, attacking parts not in the line of progress. Epidemics are not under the influence of winds, as they frequently advance in a direction directly contrary to these. 5. The *mode of onset* may be sudden or more or less gradual; usually the latter. An epidemic disease also generally gives indications of its approach by the occurrence of cases attended with some of its symptoms in a mild form; thus, cholera is generally preceded by cases of diarrhœa; or a few sporadic cases may occur, giving warning of its approach. 6. The *intensity* of an epidemic is subject to much variety, the disease being in some instances exceedingly fatal, in others comparatively mild. It is most virulent, as a rule, at the early period, judged by its characters and fatality. This is partly explained by the fact that probably those are first attacked who are most predisposed. 7. The *mode of disappearance* is generally gradual also, the cases becoming by degrees less severe and fewer in number; but it may be rapid, either from some evident cause or not. 8. The *duration* of an epidemic is very irregular. It may persist with intermissions for several years, *e. g.*, cholera. 9. *Cycles of epidemics* are frequently observed, one disease being after a certain time followed by another, and this by a third, and so on. The theory has been advanced to explain epidemics,

that there is what is termed a *pandemic wave*, under the influence of which a series of *oscillations of febrile diseases* occur, these following each other regularly over the globe. 10. It is most important to notice that epidemics are greatly under human control, and that they can be prevented or made much less severe by attention to proper hygienic and other measures, to be presently considered. With the advance of civilization some epidemic diseases have been entirely eradicated from countries and districts where formerly they were exceedingly rife; and by well-directed efforts there is no reason why many others should not be completely expelled. 11. Epidemic influences seem to affect other animals at the same time as human beings, and it is not at all improbable that the same is true with regard to plants.

III. ON THE HYGIENIC TREATMENT OF CONTAGIOUS FEVERS AND THE PREVENTION AND LIMITATION OF EPIDEMICS.

A most important object to be kept in view, when treating a patient suffering from an infectious fever, is to prevent its extension to others, and the means which promote this end are also useful as regards the wellbeing of the patient. The measures to be attended to will now be briefly considered.

1. *Separation* is necessary from other individuals as far as possible, and in many cases almost complete *isolation*. At all events anything like overcrowding must be avoided, and only those persons who have any business in the sick-room should be admitted. They should wear clothes to which the contagium cannot easily adhere, and go as little as possible into the midst of healthy people. Medical men ought to take sufficient precautions against conveying any contagious affection.
2. Adequate *ventilation* is essential, and this is best carried out by placing the patient in a large room, and opening the windows more or less according to the weather, which should be done even at night, care being taken of course to protect against draughts. A good fire in the room assists ventilation.
3. All excessive curtains, bedclothes, carpets, and other things which may act as "fomites," ought to be removed. In this way also ventilation is promoted.
4. *Cleanliness* must be thoroughly attended to, as regards the patient, bed, clothing, room, etc.
5. Those who come close to the patient should avoid inhaling the breath or exhalations, and should afterwards not swallow the saliva but clean out the mouth and nostrils.
6. One of the most important matters to attend to is the *disinfection* or *complete destruction* of everything which might convey the contagion. In the first place all *exhalations and discharges* should be *at once disinfected*. Anything coming off from the skin is best destroyed by frequent sponging with some disinfectant. The air of the room should also be somewhat impregnated with some

volatile material of this nature, such as chlorine (from chloride of lime), carbolic acid, or sulphurous acid. It is also recommended to place across the doorway a sheet moistened with dilute carbolic acid, Burnett's fluid, Condy's fluid, or chloralum. Secretions from the nose or mouth ought to be removed by disinfected rags and these immediately burnt. Excretions should be received into utensils containing some disinfectant, and thoroughly mixed with this before being removed from the room. This is especially needful in the case of those diseases which are known to be propagated chiefly by the stools, viz., cholera and typhoid, and if possible a separate water-closet should be used for the reception of the excreta in these affections, which should be frequently flooded with some disinfecting fluid. The best disinfectants for this purpose are carbolic acid and powder, chloride or sulphate of zinc, chloride of lime, or chloralum. All clothing, bedclothes, etc., must be put at once into vessels containing some disinfecting fluid, especially Condy's or chloride of lime, before being taken out of the room for the purpose of being washed. The clothes previously worn by a person suffering from a contagious disease ought also to be disinfected. The floor, doors, windows, etc., should likewise be frequently washed with some material of this nature. 7. Food, such as beef tea, must not be allowed to remain for any length of time in the sick-room, and should never be taken by any one who is not habitually in it. 8. After the patient has left the room it should be thoroughly cleaned and disinfected in every corner, and then whitewashed, or repapered and painted. Sulphurous acid, chlorine, or carbolic acid are most useful for disinfecting an unoccupied apartment. It is very valuable for disinfecting bedding and bedclothes.

It is necessary to carry out these measures more or less thoroughly in proportion to the degree of contagiousness which the particular disease presents. For example, it is requisite to pay strict attention to them in the case of scarlatina and smallpox.

When an epidemic has appeared or is about to threaten to invade a locality, precautions are called for as regards attention to proper hygiene, ventilation, and other matters. Under these circumstances it is necessary to treat ignorant individuals what to do, and to appoint competent persons to visit from house to house to see that the different measures are properly carried out, especially in low and crowded parts of towns and cities. The chief practical points to be noticed are as follows:

1. ~~Close~~ ^{Close} cases must be strictly observed in every particular. Frequent washing and whitewashing of premises is necessary.
2. All overcrowding must be prevented and free ventilation maintained upon.
- It is particularly necessary to look to this among the ~~poor~~ ^{poor} and in common lodging-houses or crowded alleys.
3. Persons who are likely to spread disease must not mingle with others in public resort.

Special attention must be paid to all *decomposing organic matter*, especially *house refuse*. Everything of this description should, if possible, be at once removed, having been previously disinfected, or if it cannot be got rid of, abundance of disinfecting material must be mixed with it. House-drains and sinks, street-drains and sewers, water-closets, cesspools, privies, ditches, etc., require careful and frequent examination, so that they may be kept in order. The earth in the neighborhood of dwelling-houses is often saturated with organic matters, and therefore demands attention. During the removal of organic matters from houses, it is well for the inhabitants to keep away as much as possible. 5. Disinfectants should be freely employed in and around the houses, and especially where there is much filth. 6. It is most important to look to the source of the *water supply*, especially that which is used for drinking purposes, and to see that no organic matter find its way into it from sewers, drains, cesspools, polluted ground, etc. The waste-pipe of cisterns often opens into drains, and, owing to an imperfect state of the traps, organic matters become mixed with the water. This point must be especially attended to during an epidemic of typhoid fever or cholera. On no account should water be taken which contains any organic matter, and it ought always to be filtered. 7. It may be advisable to remove healthy persons to some place where they would be free from the danger of infection. 8. If there is any known preventive of an epidemic disease, this must be at once resorted to and fully carried out. Thus vaccination should be thoroughly enforced during an epidemic of small-pox in the case of all who have not been previously vaccinated. 9. It may be requisite to carry out the practice of "quarantine." 10. It is important that the *general health* of the community should be maintained by every means possible, and all causes that tend to lower the system, such as intemperance or bad living, should be avoided. It is particularly necessary for those who attend upon the sick to take every precaution. They should live well but not take too much stimulants. They require daily exercise in the open air, but should avoid fatigue. They also need sufficient sleep, and must pay strict attention to cleanliness. 11. Any person who presents the *slightest symptoms* of the disease which is epidemic ought to be *without delay* brought under medical treatment. 12. On no account should an individual suffering from an epidemic disease be brought into the midst of a healthy locality, if this can possibly be avoided. The conveying of such persons by vehicles used by the public is a serious crime, which is now punishable by law. Special conveyances are provided should it be necessary to remove them to a hospital.

CHAPTER III.

ON THE CLINICAL INVESTIGATION OF ACUTE FEBRILE DISEASES.

A LARGE proportion of the cases which come under observation in ordinary practice belong to the class of *acute febrile diseases*, and it is most essential to have a clear notion how to proceed in their investigation, because it is particularly important that a correct diagnosis should be arrived at in these cases as speedily as possible. The special points which require attention are as follows:

1. It is well first to inquire what febrile complaints the patient has previously suffered from, if any. It should then be ascertained whether the patient has been exposed to any infectious disease, or whether there has been any other obvious cause at work likely to give rise to a febrile condition, *e. g.*, malaria, cold, etc.

2. If possible, the *exact date, even the hour*, of the onset of symptoms must be fixed, and the *mode of invasion* determined.

3. The *symptoms* which have arisen in the course of the case are then to be inquired about, as well as the times at which they appeared, and those noted which exist at the time of examination of the patient. During the *premonitory or early stage* of the acute specific fevers certain *local symptoms* are usually present differing in each and more or less characteristic. Those which require to be particularly investigated are, the severity of general pains; the existence of any localized pain, especially in the back or epigastrium; catarrhal, throat, stomach, intestinal, and head symptoms. Of course if the pyrexia is due to inflammation of some organ or tissue, there will probably be local symptoms indicating the seat of the mischief.

4. It is of the greatest importance to determine the *degree of pyrexia*, as well as its *course and mode of progress*. This is done by the careful and systematic employment of the thermometer. In this way even at a very early period much assistance is gained in arriving at a diagnosis. In the *exanthemata* the fever is of the *continued* type. By its degree of intensity and rapidity of onset the nature of the complaint may, in many cases, be foretold at a very early stage. Each fever is supposed to have a definite course of temperature, and on the whole this is true; but a good many exceptions are met with.

5. Most of the *acute specific fevers* are attended with a *skin eruption*. This constitutes one of their chief *anatomical characters*, and generally enables each of them at once to be distinguished from all others. It must be remembered, however, that it is not always present, for there

is no doubt but that scarlatina, measles, small-pox, etc., may run their course without any eruption. When due to inoculation it may be confined to the spot where the morbid material is introduced, *e. g.*, vaccinia. The points to be ascertained with regard to any eruption are: *a.* The *exact time* of its appearance after the first onset of symptoms. *b.* Its *primary seat*, as well as the parts of the body to which it spreads, and the mode and rapidity of its extension. *c.* Its ordinary *amount*. *d.* Its *precise characters* from its first appearance to its decline, including any changes it may undergo during its progress. *e.* Its *duration*, both as regards the entire eruption and its individual constituents. *f.* The cutaneous *sequelæ* which may follow it, such as desquamation. *g.* The chief *varieties* it may present.

6. In all febrile cases it is imperative to make a careful *physical examination* of all the chief organs of the body, and to *examine the urine*. This may reveal the cause of the pyrexia even where there are no symptoms pointing to any particular organ. Besides, it must be borne in mind that even in the specific fevers complications are very liable to arise, or some of the organs may be primarily affected, and it is most important to detect any derangement in connection with these as soon as possible. Hence *daily examination* at least should be carried out, and in many cases it is requisite to examine the principal organs even more frequently than this. The *sphygmograph* is of value as indicating the condition of the circulation.

ON THE USE OF THE THERMOMETER.

The value of the *thermometer* in the investigation of disease is at present so generally recognized in theory that it is unnecessary to enter into any discussion on the subject; at the same time it is desirable to impress upon all the extreme importance of employing this instrument in *daily practice*, because there can be no doubt that even now many do not use it to the extent which it deserves.

Neither is it requisite to give any detailed description of the instrument to be made use of. All that need be said is, that this should be sensitive and accurate; of a sufficient range; self-registering; and of a convenient size to be carried in the waistcoat-pocket. These conditions are fulfilled in the clinical thermometers which are sold in most respectable instrument shops.

Mode of Use.—Before applying the thermometer, it should be warmed by holding the bulb in the hand, or in some other way, until the top of the *registering index* reaches about 98°, but care must be taken that it does not rise above this. The regions usually employed for taking the temperature are the axilla, the inner side of the upper part of the thigh, the mouth, rectum, or vagina. Sometimes it is requisite to notice *local*

temperatures. It is necessary that the instrument should be in close contact with the surface and completely covered. When the temperature is taken in the axilla, which is the most convenient place on the whole, the patient should lie on the same side, and press the arm firmly to the side; or it may be necessary to strap it to the surface. The mouth does not afford accurate results, but it may conveniently be made use of to give approximate information, the thermometer being placed under the tongue and the mouth firmly closed. With regard to the time required for the instrument to be retained in its position, there is a difference of opinion. With proper precautions *five minutes* is usually sufficient, especially if "two observations at intervals of one or two minutes give exactly the same result" (Aitken). To be strictly accurate, however, many think that the mercury ought to *remain stationary for five minutes*. Baumler gives, in order to be scientifically correct—for the rectum, three to six minutes; mouth, nine to eleven minutes; axilla, eleven to twenty-four minutes.

It is desirable, if possible, that the individual upon whom the observation is made should have been at rest in bed at least an hour previously.

The intervals at which the temperature should be taken will vary according to the nature of the case. Often only one observation is required. In most instances twice a day is sufficient, viz., in the morning and evening, and in many once daily is enough. Sometimes, however, it is most important to note the temperature at very frequent intervals, or even to allow the thermometer to remain constantly applied. Should this be needful, it is advisable to teach the nurse or some other intelligent person how to use the instrument, and they might also employ it if any unusual symptoms should arise. In all cases of fever it is requisite to have recourse to the thermometer until convalescence has been firmly established, for reasons to be presently indicated.

In using the thermometer the points to be observed are—1. The degree of heat, as indicated by the *end of the index most distant* from the bulb of the thermometer. 2. The rapidity with which the mercury rises, this being in proportion to the height of the temperature. It is often important to take a note at the same time of the *frequency of the pulse and respirations*, and in some cases it is desirable to make a *quantitative analysis* of the urine, in order to determine whether there is a relation between the temperature and the amount of urea, uric acid, etc., discharged. All these observations should be recorded on proper forms, of which several have been planned, the temperature being indicated by angular lines or curves.

Temperature in Health and Chief Modifying Influences.—In the axilla the temperature in health averages about 98.4° F. It may range however, from 97.3° to 99.5° or even 100°, but if it goes beyond this in either direction, and remains persistently above or below the normal, there is something wrong. The chief circumstances which influence the tempera-

ture in health are as follows: 1. *The part of the body* in which it is taken. It is higher in internal parts, such as the rectum or back of the mouth, than in external parts; in sheltered regions of the body than those which are exposed; over the trunk than over the limbs. 2. *Age*. The temperature, according to most observers, is higher in children and young persons than in adults. It also is said to rise in old age. 3. *Time of the day*. During the day the temperature gradually rises until evening, and then falls slowly until early morning, when it again ascends. In this way there is a variation of about 1.5° during the twenty-four hours in adults, but the range is greater in children. 4. *Climate and exposure to heat or cold*. In the tropics the average temperature is a little higher than in temperate or cold climates, and it may reach 99.5° or even 100° F. Long exposure to great heat or cold will also influence it a little. 5. *Food and drink*. After a full meal the temperature at first falls, but it rises as digestion proceeds. *Fasting* lowers the temperature. Alcohol seems to cause a speedy fall, but this is only temporary, and a considerable quantity is required in order to influence the temperature materially. Certain articles in daily use produce some effect, such as tea and coffee. 6. *Exercise* increases the temperature, especially that of the extremities, provided it is not sufficient to induce great fatigue. 7. Prolonged study and other forms of mental effort cause a slight depression. 8. Mr. A. B. Garrod has found that the temperature rises on stripping off the clothes and exposing the surface of the body, and the difference is greater in proportion to the coldness of the surrounding air. When the temperature of the air is above 70° F., there is a slight fall, but a rise to the previous temperature soon takes place.

The *chief source* of the animal heat is usually believed to be the chemical and vital changes in the food and tissues which are constantly going on in the body, the heat thus produced being diminished by evaporation from the surface, while the circulating blood causes the temperature to be uniform throughout. The influence of the nervous system upon temperature has been already considered. Dr. Beale believes that the *conversion of non-living into living material* is the cause of the production of heat.

The Use of the Thermometer in Disease.—In the great majority of cases the deviation from the normal as regards temperature which occurs in disease is in the direction of excess, there being more or less *pyrexia*. By the aid of the thermometer the amount of this increase can be accurately determined, and it is for this purpose that the instrument is chiefly employed. Occasionally the animal heat is below the normal, or it may be unequal in different parts of the body, but these deviations are not of nearly so much consequence. It may be mentioned here that Fahrenheit's scale is used throughout this work.

In this place it is only intended to sum up concisely the circum-

stances under which the thermometer is valuable. When treating of individual diseases it will be pointed out in connection with which of them the temperature presents any peculiar characters as to degree or range.

The information given by the thermometer may prove of valuable assistance as regards—1. Diagnosis; 2. Prognosis; 3. Treatment.

1. Much help is constantly derived from the thermometer with respect to *diagnosis*, and the following remarks may serve to gather up the circumstances under which it is thus useful. *a.* In many cases which present themselves in ordinary practice, where symptoms exist which might or might not belong to the premonitory stage of some acute illness, taking the temperature may at once clear up all doubt. Thus we have frequently found in the out-patient room, where symptoms suggestive of scarlatina or small-pox were complained of, by the help of the thermometer we have been enabled to negative the supposition of either of these diseases being present, or, on the other hand, to corroborate such an opinion. In short, the instrument enables us at once to determine whether pyrexia is present or not, as well as its degree, and thus becomes a most valuable guide to the physician. *b.* Occasionally by one, or at most two observations, it is possible to ascertain positively the *nature of a fever*. For instance, if the temperature suddenly rises to 104°, or 106° F., the patient having been quite well on the previous day, he is probably suffering from some form of malarial fever, and this is certain if the temperature falls rapidly, so that it becomes normal in a few hours. *c.* Many febrile disorders are now known to have tolerably regular and uniform ranges of temperature throughout their entire course, and to present peculiar diurnal and nocturnal variations, the temperature being, as in health, generally higher by night than by day. It is therefore essential to become acquainted with this portion of the *natural history* of each of these affections, and to employ the thermometer regularly in investigating them, so that they may be thus distinguished from each other and from all complaints which may simulate them. *d.* The habitual use of the thermometer may lead to the discovery of disease when there is no obvious sign of its existence, for the fact of a patient presenting a temperature above the normal would call for a more minute examination, which would probably end in a complete diagnosis. This has been frequently observed by those who employ the thermometer in lunatic asylums, who have thus detected phthisis in insane patients when they could not otherwise have suspected it. *e.* Complications occurring during the progress of fevers or during the period of convalescence, as well as relapses, are indicated by a disturbance of the typical range; by delayed defervescence; or by a rise in temperature after it has once subsided; and this may be the first thing observed. Hence the necessity of taking a daily note of the temperature until the patient has quite recovered. *f.* In certain diseases the

thermometer gives information as to whether a morbid process is actively progressing or not, *e. g.*, in tubercular affections. Further, it may serve to distinguish between different forms of a particular affection; thus *pulmonary phthisis* may be the result of different pathological conditions, and it is probable that these are characterized by distinct types of temperature. Again, when hæmoptysis has occurred, the thermometer is useful in indicating whether any blood which remains in the respiratory organs has given rise to inflammation, this being attended with a rise of temperature. The same is true of an apoplectic clot in the brain. *g.* Inequality of temperature is sometimes of aid in diagnosing paralysis or other nervous disorders.

A word of caution is necessary with regard to children. In these subjects the temperature may run up rapidly to a considerable height when there is nothing very particular the matter, and therefore care must be taken not to jump to a hasty conclusion that there is some serious disease present, simply because the thermometer indicates much pyrexial heat. It often falls just as speedily.

2. The temperature may be of use in assisting towards a *prognosis*, either in itself, or from its relation to the pulse, respirations, or amount of excreta, or its association with other symptoms. *a.* The *degree of heat* observed during the early period of a febrile disease, especially when taken in conjunction with the symptoms present, will often give a good idea as to whether a particular case is likely to be a severe one or not. If it is at all high, it shows that a sharp attack may be anticipated, and that complications resulting from the presence of products of decomposition in the blood are liable to arise; therefore a guarded prognosis should be given. *b.* A very high temperature, especially when it exhibits a tendency to a rapid rise, is extremely dangerous, especially if the excretions are deficient. *c.* A sudden change in the temperature may indicate something that is going to happen, for some days before it actually occurs. Thus a marked fall in typhoid fever not uncommonly precedes hæmorrhage from the bowels, and gives warning of its approach. *d.* If the temperature does not increase, or if it falls from morning to evening, this is a favorable sign; if it is higher in the morning than on the previous evening, this shows that the disease is advancing and the prognosis is consequently more grave. *e.* In many pyrexial diseases the fever usually subsides on certain days, often by crisis; if, in a particular case, the expected fall takes place and defervescence goes on regularly and continuously, the prognosis is favorable; if the contrary, or if the decline of the fever is irregular, an unfavorable course is indicated. *f.* Should the temperature decline rapidly in certain acute febrile affections, such as pneumonia or typhus fever, while the pulse and respirations increase in frequency, and the other symptoms show no signs of improvement, but

on the other hand become worse, the prognosis is very serious. A very low temperature is, in itself, an evil omen.

It must be remembered that accidental circumstances may temporarily modify the temperature in disease as in health, such as food, exercise, excitement, etc. It may be increased by sources of irritation, *e. g.*, retained urine or *fæces*, and on the removal of these it may be considerably reduced. Defervescence may proceed so far that the animal heat is brought below the normal, sometimes considerably. After convalescence from severe continued fevers the temperature is often low for some time. The same thing is also observed during the *appyrexial* periods of intermittent fever, and in the remissions of the remittent variety.

3. The value of the thermometer as indicating *treatment* may be gathered from the remarks already made, and it will be only necessary to give two or three illustrations. A *very high and ascending temperature* calls for prompt recourse to the use of cold, as already described under the treatment of pyrexia. In *ague*, after this disease has apparently subsided, it is found that the temperature still rises at the usual intervals, and until this has become quite normal for two or three days, treatment must not be discontinued. During convalescence from fevers an increase of heat may be due to something wrong in the diet or in the use of medicines, and it should lead to careful inquiry on all matters by which it might be produced, so that appropriate measures may be adopted.

In the following description of the individual *acute specific diseases*, I have deemed it expedient in the case of the more common fevers, to omit the consideration of the *diagnosis* under each particular affection, and to devote a separate chapter to a general summary of this subject.

CHAPTER IV.

SIMPLE CONTINUED FEVER—FEBRICULA—SYNOCHA.

A CONSIDERABLE number of cases come under observation in ordinary practice, which present the usual symptoms of *fever*, but which cannot be referred to any of the contagious fevers, nor can the symptoms be traced to any adequate local cause. Besides these there are not uncommonly anomalous forms, to which various names have been applied. Though many of these cases scarcely come under the class of acute specific fevers, they may conveniently be described here.

ETIOLOGY.—Simple febricula does not seem to be contagious or to depend upon any specific poison as a rule. It may result from cold; excessive heat, such as long exposure to the sun; overeating or drinking; or great fatigue. Often no distinct cause can be made out. Probably some of the cases are due to the action of one of the contagious poisons, modified by the constitutional condition of the individual, or by the quantity entering the system being very minute. I have known a severe epidemic of typhoid fever to be preceded by cases of mere febricula.

SYMPTOMS.—Febricula is characterized by the ordinary signs of *fever* in their most typical and simple form, but of variable intensity. The *invasion* is indicated either by chilliness or slight rigors, with general pains, lassitude, and headache. Then the skin becomes hot and dry, and the pulse frequent and full. Severe headache is often complained of, the face is flushed, while the patient is restless and sometimes delirious at night. There is thirst, with furred tongue, loss of appetite, and constipation. The urine is febrile. Frequently symptoms are present indicative of catarrh of the mucous membranes, but these are not sufficient to account for the pyrexia. Roseolar or erythematous eruptions have been described as appearing in some instances, and also certain bluish spots.

The rise in temperature is rapid, and it may reach 102° , 103° , or even 104° in a few hours. This high temperature, however, only lasts for a short time usually, often but a few hours, or at most one or two days, and then it falls rapidly.

DURATION AND TERMINATION.—The *duration* is generally about three or four days, but a case may last a week or ten days before convalescence is complete. Defervescence is usually by *crisis*, the temperature falling to the normal in from twenty-four to thirty-six hours, and there being a copious discharge of urine with abundant deposit of lithates, free perspiration, and sometimes diarrhœa, or epistaxis. Occasionally defervescence is by *lysis*, convalescence being consequently delayed. The termination is always in recovery.

TREATMENT.—All that is required is to keep the patient in bed; give a diet of milk, beef tea, etc., with cooling drinks; open the bowels freely; and administer some simple saline mixture. If there is much heat of skin tepid sponging is very useful. During convalescence quinine may be given.

CHAPTER V.

TYPHUS FEVER.

ETIOLOGY.—Typhus fever is generated by a *specific poison* and is highly contagious. This poison is principally given off in the exhalations from the skin and lungs, being afterwards inhaled or swallowed. These exhalations have a peculiar odor. Infection is far more likely to happen in the case of those who are brought into close and frequent contact with the sick, and hence nurses and medical men are very liable to be attacked. It must be borne in mind, however, that if there are a number of cases congregated together, so that the poison is concentrated, a very short, even a momentary exposure may cause the disease to be transmitted. The contagious influence does not seem to spread to any great distance, and is much weakened by dilution with air. In well-ventilated private houses the disease rarely spreads, and it never extends from hospitals to adjacent streets. It is more likely to pass from a low story to a higher than in the contrary direction. Fomites, such as clothing, bedding, furniture, or the walls of rooms, may retain the contagium for some time if not properly disinfected, and may thus subsequently originate the disease in the same place or convey it to other districts. Woollen and dark-colored materials are said to take up the poison most readily. Typhus fever is stated to be most contagious during convalescence, but infection probably lasts from the end of the first week until convalescence is established. A second attack is an exceedingly rare event.

The opinion is strongly held by some eminent observers that typhus fever may be produced *de novo*, independently of any infection, in consequence of great overcrowding and destitution.

Predisposing Causes.—There are certain circumstances which greatly intensify the action of the typhus contagium and render individuals more liable to be attacked. These are: 1. A low physical condition, induced by intemperance and bad feeding, or chronic disease. 2. Overcrowding and deficient ventilation, especially overcrowding of dwelling-houses, or of individuals in the same house or room, with bad ventilation. 3. Want of cleanliness, domestic and personal. 4. Mental depression, from overwork or anxiety, or fear of contagion. 5. A temperature not too high. In consequence of the action of these causes, typhus fever is infinitely most prevalent amongst the poor; in the crowded parts of large towns, especially in those places where the sanitary arrangements are inefficient; in low regions; in crowded camps or dwelling-houses, such as low lodgings; and in cold and temperate

climates. Epidemics are also very apt to arise during periods of distress and famine from any cause. Typhus seems to be much more rife in Great Britain and Ireland than in other countries, and it is stated not to occur within the tropics. Mental causes appear to act chiefly in connection with persons belonging to the better grades of society. Something may probably be attributed to *individual susceptibility*, some persons being more prone to be attacked than others.

ANATOMICAL CHARACTERS.—The *blood* is much altered in typhus fever. It either remains fluid or forms very soft clots, and tends to decompose rapidly. The fibrin is diminished, and the red corpuscles, which are increased in number at first, afterwards become deficient. The salts are in excess, while urea and ammonia are present, the latter being supposed to result from the decomposition of the former. Under the microscope the red disks are seen to be irregular in form and crenated, and they collect in amorphous heaps. The coloring matter transudes and tinges more or less the tissues and the fluid in serous cavities.

The body does not usually present much emaciation, but decomposes speedily. The maculæ on the skin which are observed during life are frequently persistent after death.

The voluntary muscles are of a dark color and softened. Their fibres often exhibit signs of degeneration under the microscope. Sometimes hæmorrhages take place into them. Similar softening with fatty degeneration is observed to a marked degree in the heart. It is believed also that the same change occurs in connection with the involuntary muscular tissue generally.

There is nothing characteristic in the brain. There may be some congestion and excess of serum, and occasionally slight arachnoid hæmorrhage has been observed. In some epidemics forms of cerebro-spinal meningitis have been described.

All the organs are commonly hyperæmic, softened, friable, and enlarged, especially the liver and spleen; the latter may be quite pulpy, but does not reach a very great size. The salivary glands are frequently inflamed and may be the seat of suppuration or gangrene. Acute nephritis is sometimes observed.

In the alimentary canal the appearances which may be met with are redness and softening of the gastric mucous membrane; congestion or inflammation of that lining the intestines, especially the colon; and enlargements of the glands, which is particularly noticed in children. There is nothing characteristic in these appearances, nor is there ever any deposit or ulceration such as typhoid fever presents.

There may be various lesions of the nature of complications. Bronchitis is very commonly observed, as well as hypostatic congestion of the lungs, which may end in hypostatic pneumonia. Sometimes ordinary acute pneumonia exists.

SYMPTOMS. I. Incubation.—The *period of incubation* is usually from nine to twelve days, but it may not go beyond six days. During this time there may be such symptoms as chilliness, general pains and malaise, restlessness, headache, and loss of appetite, but these may be entirely absent and are not significant.

II. Actual Attack. 1. Invasion.—The invasion may be singularly sudden, as I know from personal experience, and it is usually tolerably marked. The disease begins either with a series of slight or moderate rigors, or with one severe and prolonged fit of shivering, followed by pyrexial symptoms. The rigors often recur for two or three days. There is a marked sense of depression and exhaustion, the patient speedily taking to his bed and presenting an aspect of weariness and heaviness, or even of considerable prostration. General muscular pains are complained of, and the limbs tremble on movement. Nervous symptoms are prominent. These are dull frontal headache, often severe, with a feeling of heaviness in the head and throbbing; giddiness; more or less dulness of hearing with noises in the ears; flashes of light and photophobia; sometimes an unpleasant smell; restlessness and disturbed unrefreshing sleep, though the patient is often very drowsy. The mind soon begins to wander and becomes confused as to time, place, and surrounding circumstances and individuals, distinct delirium setting in from the fourth to the eighth day, which is not constant at first, while the patient can be roused to answer questions. It is most frequently of a dull and muttering character, but may be extremely active and excited at the outset, the patient being sometimes very violent. The expression is heavy and indifferent, the eyes are injected and suffused, and a more or less dusky flush covers the cheeks, the complexion having a dingy and dirty appearance.

Nausea and vomiting are sometimes present and may be distressing symptoms. The tongue is at first covered with a thick white fur, but soon tends to become dry and brown; it is often tremulous. There is much thirst, with total anorexia and a disagreeable slimy taste in the mouth. The bowels are generally confined, but diarrhoea is not uncommon, the stools, however, presenting no peculiar characters and being usually dark. The spleen can often be detected to be enlarged. The skin feels hot and pungent. The pulse becomes frequent, rising steadily to 100 or more, and being often large and full, but very compressible; it may be small and weak or dicrotic. The urine is markedly febrile.

Commonly there are signs of more or less catarrh of the nasal and respiratory mucous membranes, with cough and expectoration, and some dry râles may be heard over the chest.

2. Eruptive Stage.—Two forms of eruption are observed in typhus fever, viz., a *subcuticular mottling*; and distinct *maculæ or mulberry spots*. Usually both are present in variable proportions, but the mottling

is not unfrequently noticed without the spots, though the latter very rarely appear without the former. Children often do not exhibit any rash and in them the mottling is most marked. The eruption usually appears on the fourth or fifth day, but may come out at any time from the third to the seventh or eighth day. The back of the wrists, borders of the axillæ, and epigastrium exhibit it first; it then spreads rapidly over the trunk and limbs, but is rarely seen on the face and neck. *The rash is all out within one, two, or three days, and no fresh spots are developed after this, while each spot is perceptible until the entire rash disappears.* The amount varies considerably, but the maculæ are frequently very numerous and may cover the skin almost completely.

Characters and Course. a. Maculæ or Mulberry Rash.—A number of distinct spots are first observed, varying in size from mere points to two or three lines in diameter, the larger being formed by the union of smaller ones. They are irregularly roundish, the larger spots being the more irregular; their margin is ill-defined. They are quite superficial, and at first are often slightly raised, but this elevation subsides in a day or two. The color is described as resembling the stains of mulberry juice, being as a rule, at the onset, of a brightish or pinkish-red. It is deeper at the centre than at the margin, and completely disappears under pressure, returning again when the pressure is removed. In a few days the hue deepens, and may become purple, or dark crimson, or livid, especially towards the centre of the spots, which at the same time become more defined at their edge. This is especially observed over the back and other dependent parts. Pressure only diminishes the color after three or four days, a light-yellow stain being left, and finally it does not affect it at all, the spots being in fact converted into true petechiæ, of a uniform hue. The eruption, viewed as a whole, has not an equal depth of color.

b. Subcuticular Mottling.—This is most marked in dependent parts, and is described by Dr. George Buchanan as “a faint, irregular, dusky-red, fine mottling, as if below the surface of the skin some little distance, and seen through a semi-opaque medium.”

The *duration* of the rash varies. It usually subsides from the 14th to the 21st day. The *mottling* disappears more readily and sooner than the *spots*, and the latter remain longer if they become petechial. No desquamation follows the disappearance of the eruption.

The skin of dependent parts is more or less congested, especially that of the back. Miliary vesicles or sudamina may appear about the end of the second week, usually over the groins, subclavicular regions, or epigastrium. A peculiar odor is given off from the skin of persons suffering from typhus.

During the eruptive period most of the symptoms previously existing become worse, and tend to be of a low, adynamic or typhoid character.

The headache, however, usually subsides on or before the 10th day, and if it should continue along with marked delirium, this is a sign of danger, indicating some cerebral complication. Debility and prostration become very marked, the patient lying helplessly on his back, with the eyes closed or half-closed, in a state of muttering delirium, from which it is difficult or impossible to rouse him. Somnolence often sets in, which may be followed by complete stupor and coma. Muscular twitchings and trembling, rigidity, and picking at the bedclothes are frequently observed, and occasionally convulsions with strabismus. Sometimes coma-vigil is noticed, the patient lying with the eyes wide open, apparently awake, but staring vacantly into space. The complexion becomes muddy-looking, and a more dusky flush covers the face, which may be almost livid. The conjunctivæ are extremely injected and suffused, the pupils being often contracted. The skin of the extremities becomes cold and perspiring. The tongue is dry, brown, and cracked, frequently covered with a thick, blackish crust, and immovable; its surface is red and tends to bleed; while sordes cover the lips and teeth. Patients drink with avidity, but deglutition is difficult. The nostrils are stuffed up. Tympanitis is sometimes a prominent symptom. The pulse rises to 120, 140, 150, or more, but remains stationary after reaching a certain point; it becomes small and weak, and may be irregular. The heart's impulse and sounds are feeble, especially the systolic sound, and capillary stasis is very liable to arise. Respiration is much hurried and disturbed, and frequently unduly abdominal. The breath has a most peculiar and unpleasant odor. Physical examination of the chest reveals bronchitic râles, or more serious complications may be detected. Incessant hiccough is sometimes a distressing symptom.

The urine is not uncommonly albuminous or contains a little sugar; it may be retained or passed involuntarily along with the stools. Bed-sores are very liable to be produced over parts which are pressed upon.

The severity of the symptoms varies much in different cases, but if a case goes on to a fatal issue, prostration becomes more and more complete, the heart's force is exhausted, and the nervous symptoms indicate that the nerve-centres are still more disturbed. Before death the temperature may rise or fall rapidly, and in some instances the pulse suddenly falls. Complications may arise to hasten a fatal result.

3. *Stage of Defervescence.*—This sets in in cases of recovery from the 13th to the 17th day, generally at the end of the second week. There is a remarkable and sudden *crisis*, which often occurs at night, the patient falling into a deep sleep lasting for many hours, on awaking from which a wonderful improvement is observed in the aspect of the patient and in the symptoms. The temperature falls considerably, as well as the pulse, which gains in strength. The skin is soft and perspiring, the eruption less marked, and the complexion clearer. The

tongue becomes moist and cleans from the edges, either in patches or molecularly, and there may be some inclination for food. Delirium has ceased, the patient recognizes those around, but the mind is still confused and entirely unconscious of all recent events. There is a sense of extreme weakness, and the limbs feel as if they did not belong to the body. Unless complications or sequelæ interfere, convalescence begins at once and the strength is regained comparatively rapidly, but it is some time before this is completely restored. The tongue soon cleans, and the appetite becomes perfectly ravenous; it is only those who have experienced it who can realize the extreme sense of hunger which is felt. Much sleep is indulged in, and the mind does not regain its normal vigor for some time. A relapse of typhus is extremely rare.

Temperature.—Different observers have described different ranges of temperature in typhus fever, and this appears to depend partly upon the nature of the epidemic. The *ascent* is steady and continuous up to the 4th or 5th evening, without any morning remission. The maximum temperature is rarely under 104.9° to 105° , often reaching 107° or even above this. It may rise to 106° on the 3d or 4th evening in severe cases; in slighter cases it may not be above 103.5° . A slight morning remission is observed on the 6th morning, and a well-marked fall on the 7th day unless the case is very severe. After this a rise takes place again, but rarely to the former maximum. In fatal cases, however, it may go up to 108° or 109° . The temperature is *continuous* up to the *period of defervescence*, with a distinct but not considerable morning remission. This is more marked in cases where the temperature is high, and may average from 106° to 112° . Dr. Buchanan states that it ranges from 1° to $1\frac{1}{4}^{\circ}$ until the middle of the 2d week, and is afterwards about $1\frac{1}{2}^{\circ}$. *Defervescence* is very rapid and sudden, setting in from the 13th to the 17th day, and the temperature may fall to or below the normal in 12, 24, or 48 hours. It is often preceded by a rise above the previous day. Occasionally after the sudden fall there is a rise of 2° or 3° , and then defervescence extends over some days. In short there is a combination of *crisis* and *lysis*. As already mentioned, in fatal cases there is frequently a rapid elevation or sinking of temperature, and it may reach 109° on the one hand or 95° on the other.

Some observers have found a relation between the temperature and pulse, but this is by no means constant or uniform, and the one may be high while the other is low.

VARIETIES.—Cases of typhus fever present considerable differences as regards their intensity and the prominent symptoms observed, to which special names have been applied. The *nervous*, *circulatory*, or *respiratory system* may appear to be most implicated. In some epidemics there has been a great tendency to gangrene, hence named "putrid fever." Typhus fever may kill in a few days by the direct action of its

poison upon the system, before any local lesions have been brought about.

Niemeyer describes cases in which the earlier symptoms of typhus occurred, without any eruption or enlargement of the spleen, and in which convalescence set in at the end of a week.

COMPLICATIONS AND SEQUELÆ.—These should always be looked for and guarded against, as they may arise without any evident symptoms. The most important are: 1. *Affections of the respiratory organs*, viz., *bronchitis; pulmonary hypostatic congestion and consolidation; pneumonia; gangrene of the lung (very rare); pleurisy; phthisis; laryngitis with œdema glottidis.* 2. *Affections of the circulatory organs and blood; cardiac softening and degeneration; phlegmasia dolens; scurvy.* 3. Partial paralysis, as a sequela, which is usually soon recovered from. 4. Dysentery in some epidemics. 5. Gangrene of the toes, nose, etc., especially during the winter; or cancrum oris in children. 6. Erysipelatous affections of the skin, throat, or deep tissues ending in suppuration. 7. Suppurative inflammation or “buboes” of the parotid or submaxillary glands, beginning in the cellular tissue around. 8. Inflammatory swelling and abscesses in various parts of the body. 9. Suppurative inflammation in joints. 10. Renal disease.

TERMINATIONS AND DURATION.—Most of the cases of typhus fever end in recovery. The mortality varies in different epidemics, but the average number of deaths is stated to be about 1 in 5. The average duration is about 14 days, but it may extend to 21 days; if beyond this it is due to complications. On the other hand a case may run a much shorter course. Death may result from coma or syncope, or, most usually, from both causes combined; or it may be due to complications.

PROGNOSIS.—This is always grave and a very guarded opinion should be given. The chief general circumstances which increase the danger of any particular case are as follows: 1. The patient being of middle or advanced age. 2. The male sex to some degree. 3. A low condition of the system, either constitutional, or due to privation or fatigue, intemperate habits, previous diseases, etc. A gouty constitution is most dangerous. 4. Mental depression and a presentiment of death on the part of the patient. 5. Improper hygienic conditions, especially bad ventilation and overcrowding. 6. Neglect of proper treatment until a late period.

The symptoms and complications present afford most important indications as regards prognosis. Those of unfavorable import are: 1. Extreme prostration, with a dry, hard, brown tongue; marked tympanitis; or persistent hicough. 2. Great feebleness of the heart's action, as evidenced by the impulse sounds, and pulse; or very excited action with weak pulse; or an exceedingly frequent pulse, which is at the same time extremely feeble, irregular or intermittent. 3. Severe and early cerebral and other nervous symptoms, especially continued sleepless-

ness with delirium; deep coma or *coma vigil*; muscular tremors, twitchings or rigidity, carphology, subsultus tendinum, *convulsions*, early relaxation of the sphincters, strabismus, and *great contraction of the pupils*. 4. A very high temperature, without any remission on the 7th day, especially if it persists and shows a tendency to rise; or a *sudden fall*, the other symptoms not improving. 5. A large amount and dark color of the eruption, especially if with numerous petechiæ, and if there is lividity of the face and limbs, with deep congestion in dependent parts. 6. Suppression or retention of urine; deficient elimination of solids; the presence of much albumen or blood in the urine, especially if associated with casts: and particularly the early occurrence of these symptoms. 7. Signs of collapse. 8. Pulmonary complications, gangrene, erysipelas, etc.

TREATMENT.—The principles already laid down with regard to the treatment of *fever* are those which must be followed in the management of cases of typhus. There is no possibility of stopping its course, and all that can be done is to assist nature in bringing the disease to a satisfactory termination.

It is most important to attend strictly to all the hygienic conditions which demand attention in contagious fevers, and particularly to look after every point connected with the sick-room, including the nursing. These matters are often of greater moment than any medicinal treatment, and always aid considerably in conducting a case to a successful issue, while they prevent the dissemination of the disease.

It may be laid down as an invariable rule of practice that patients suffering from typhus *will not bear any kind of lowering treatment*, but that they always need to be supported more or less, and their strength must be husbanded in every possible way. They should take to bed at once, and use no exertion whatever, on no account being permitted to get up to stool, but a bed-pan being employed. From the first a nutritious and easily assimilable *diet* must be administered, chiefly consisting of liquids, such as milk, beef tea, chicken broth, etc. It is essential to give them at regular intervals, in considerable quantity, and *not to neglect them by night*.

Alcoholic stimulants are required in the great majority of cases, but they ought not to be given recklessly, the nature and quantity of the stimulant to be employed being determined by the careful consideration of each individual case. Port or sherry wine or spirits, especially brandy, answer best as a rule, and they should be given in stated doses at regular intervals, by night as well as by day. It is well to begin with a small quantity and gradually increase this as circumstances indicate, the amount being again reduced as the symptoms improve. Stimulants are not usually required during the first few days, but in the case of the aged, the intemperate, and those who are much debilitated from any cause, they are called for at the outset. The signs

which chiefly indicate the necessity for alcohol are: 1. A feeble state of the circulation, as shown by the pulse, heart's impulse and sounds, a tendency to capillary stasis, or any disposition to syncopal attacks. 2. The existence of typhoid symptoms, the amount needed being usually in proportion to the intensity of these symptoms. 3. A large amount and dark color of the eruption with abundant petechiæ. 4. Profuse perspiration, the other symptoms not improving. 5. Coldness of the extremities. 6. The existence of complications of a low type. On the other hand, alcohol is contraindicated or requires to be cautiously administered should there be a very hot and dry skin; symptoms of much cerebral excitement; or conditions of the urine pointing to deficient elimination on the part of the kidneys. In all cases the propriety of continuing or increasing stimulants must be judged of by the effects produced.

General Therapeutic Treatment.—If a case of typhus is seen at an early period, many recommend the administration of an emetic. The bowels should be kept open daily by some mild aperient, or by the use of simple enemata. In order to maintain *free elimination*, it is advisable to allow the patient plenty of drink, which may contain citrate of potash, nitre, cream of tartar, or chlorate of potash. Tea, coffee, and salt are also given for this purpose. The medicines which have obtained most repute in the treatment of typhus are the dilute *mineral acids*. Nitric, hydrochloric, or a combination of these, sulphuric and phosphoric acids are those chiefly employed. They may either be made into a drink, or given in 10, 20, or 30 minim doses every three or four hours. Sulphuric acid answers best when typhoid symptoms set in. *Quinine* in moderate doses is another valuable remedy, and it may be very advantageously combined with one of the acids. *Tincture of iron* has also been highly recommended.

Various *antiseptics* have been tried, viz., carbolic acid, sulphocarbolates, creosote, sulphites, Condry's fluid, peroxide of hydrogen, etc., but it does not appear that they are to be relied upon.

The *symptomatic treatment* in cases of typhus fever is often a matter requiring considerable attention. The symptoms which are likely to call for interference are heat of skin; nausea and vomiting; thirst; constipation or diarrhœa; and head-symptoms, viz., headache, sleeplessness, delirium, stupor or coma. For their treatment see pp. 100 to 103. Hiccough sometimes causes much distress. For its relief the best remedies are sal volatile, ether, spirits of chloroform, hydrocyanic acid, camphor, and musk, in various combinations. A sinapism may be applied over the epigastrium, or the ice-bag may be tried if necessary.

Should there be a tendency to marked prostration it is necessary to administer diffusible stimulants, such as sulphuric or chloric ether, camphor, musk, and carbonate of ammonia, along with alcohol. Sometimes patients become so low that they cannot swallow, and then

recourse must be had to nutrient and stimulant enemata, which should be persevered in to the last.

It is always very important to look to the state of the bladder and to draw off the urine if necessary. The various complications met with must also be watched for and every care taken to prevent them, especially *pulmonary complications* and *bed-sores*. As regards their treatment, it must be borne in mind that stimulants and tonics are indicated when inflammatory affections set in in the course of typhus.

Much care is requisite during the stage of convalescence, all over-exertion being avoided, as well as excessive eating. Tonics and change of air are very beneficial. It is especially necessary to guard against any sudden effort during the early period of convalescence, as this is liable to cause coagulation of blood in some of the principal veins. Any sequelæ which may arise must be attended to.

CHAPTER VI.

TYPHOID OR ENTERIC FEVER—PYTHOGENIC FEVER— ABDOMINAL TYPHUS.

ETIOLOGY.—Typhoid fever originates from a *specific poison* which is quite distinct from that causing typhus. Formerly they were looked upon as identical diseases, and a few still hold to this opinion.

There is abundant evidence to prove that typhoid is infectious, and when once it finds its way into the midst of a number of individuals, it tends to spread amongst them. It is most important, however, to understand clearly how the disease is conveyed. The exhalations do not appear to contain much of the contagium, and there is very little danger from merely coming into the vicinity of typhoid patients. Indeed the probability is that the malady cannot be transmitted in this way, and medical men or nurses rarely take it from attending on patients. It is in the *fæces* that the poison is chiefly contained and by their agency the disease is propagated. The atmosphere may become impregnated with the emanations from the excreta, either because the latter are thrown into some open space, or because the water-closets, privies, sewers, etc., are imperfect, and they may thus find their way into the system. *Water* is, however, the great channel by which the poison is conveyed, and numerous epidemics and endemics as well as sporadic cases of typhoid fever have been traced to some special water-supply. The materials may soak through the soil from cess-pits, or from being merely thrown on the ground, and thus obtain access into wells the

water of which is used for drinking purposes; or they may find their way into cisterns through the waste-pipes. Within a recent period it has been clearly proved also that *milk* is not uncommonly the vehicle by which the typhoid poison reaches the system, either in consequence of water containing it being mixed with the milk, or from this article of diet becoming tainted in some other way with the excreta of patients suffering from the fever. Fomites may convey the disease, but only through becoming contaminated with the typhoid stools.

The name "pythogenic" has been given to typhoid fever by Dr. Murchison, who, with others, is strongly of opinion that this complaint is as a rule *spontaneously* originated in connection with ordinary sewer emanations and putrefying animal matter, and he believes that even in the specific stools the poison is always a product of decomposition.

With regard to the precise nature of the typhoid contagium, Dr. Klein has lately made careful investigations and he has discovered in connection with the intestinal lesions peculiar organisms of the nature of fungi. These organisms are of two kinds, viz., minute roundish bodies of a greenish-brown color which undergo division; and micrococci, the latter being produced by the subdivision of the former. The relation of these organisms to the lesions is not conclusively proved, but the presumption is that they precede and are the cause of them.

Predisposing Causes.—*Age* materially influences the occurrence of typhoid fever. It is by far most common during youth and adolescence, being very rare in young infants and persons beyond 45 or 50 years of age. Individuals under 30 are twice as liable as those over 30, and half the cases occur from 15 to 25 (Murchison). *Sex* does not seem to have any effect. Cases are most numerous during autumn, especially after a dry and hot summer. Overcrowding is not a predisposing cause, but deficient ventilation may have some influence. Typhoid attacks persons in all classes of society, and is not at all more prevalent among the poor; if anything, the contrary is the case. *Individual susceptibility* is supposed to predispose, and recent comers into an infected district are said to be most liable to be affected. Persons in good health are often attacked before others, and various chronic and acute diseases as well as pregnancy, seem to afford some protection against typhoid.

ANATOMICAL CHARACTERS.—The general condition of the body will vary with the time at which death occurs. Usually there is much emaciation, rigor mortis is distinct and of moderate duration, while the excessive post-mortem congestion, rapid putrefaction, and dark color, with softening of the muscles usually met with in typhus are not observed in typhoid. The eruption is not persistent after death, but there may be the remains of bed-sores, gangrene, erysipelas or sudamina.

Alimentary Canal.—It is here that the most important morbid changes

are found in enteric fever. The *pharynx* and *oesophagus* may be congested, inflamed, covered with diphtheritic deposit, or the seat of ulceration. The ulcers are generally very superficial and are never met with before the third week. They are not the result of any morbid deposit. The *stomach* occasionally presents hyperæmia, mammillation, softening, or superficial ulceration, but is usually normal. The *small intestines* are rarely distended with gas; they contain more or less of the materials similar to those passed in the stools. Increased vascularity of the mucous membrane may be observed, either uniform or in patches, but this is by no means necessary; it is most evident towards the lower part. At a later period the color may be grayish or slate-colored. The membrane is sometimes swollen and softened, the latter being probably a post-mortem change.

The *characteristic lesions* of enteric fever consist in *certain morbid changes in connection with Peyer's patches and the solitary glands*. According to the time at which death occurs will these present different appearances, the morbid changes being divided into stages.*

1. *Stage of Deposition or Enlargement*.—The first alteration is an enlargement of Peyer's patches and the solitary glands, owing to the presence of a morbid substance, supposed by some to be of the nature of a specific deposit from the blood undergoing a peculiar development, but generally considered to be the result of a proliferation of the cell-elements previously existing. It is made up chiefly of granular matter and oil-globules, with a variable number of cells, having no special characters. This material is probably first formed within the glandular sacs, but these may burst and discharge their contents into the surrounding cellular tissue, or there may be an increase of cells here also.

It is a matter of doubt at what period the enlargement commences, and whether it is preceded by hyperæmia. Murchison states there is no previous congestion, and that a deposit has been met with on the first or second day, but Trousseau gives the fourth or fifth day as the time of its appearance.

Peyer's patches appear to be unduly prominent, being raised one or two lines or even more above the mucous membrane, and having steep edges with a smooth or granular surface; they are more or less firm, though the membrane covering them is often softened; they vary in color from pinkish-gray to different hues of red, the mucous membrane over them being sometimes purplish, and each patch is surrounded by a vascular ring. The corresponding peritoneum is also injected. The substance seems adherent to the mucous and muscular coats. On section it appears as a soft grayish-white or pale-reddish material.

* Dr. Klein has described minute morbid changes in the intestines in connection with the organisms already alluded to, but as his investigations are still proceeding, it would be premature to give an account of these here.

Two forms of patches are described, the *plaques molles* and the *plaques dures*, but there are gradations between them, and they may coexist. The latter are more prominent and firmer, and the membrane over them is smoother and more uniform. The difference between them is that in the former the deposit is less abundant and confined to the glands, which in the latter have burst and discharged their contents (Murchison).

The *solitary glands* are not always involved. In exceptional instances they may be alone affected. They vary in size from a millet seed to a pea, and sometimes look like pustules.

2. *Stage of Softening and Breaking Down.*—In rare instances it appears possible for the material to be reabsorbed without any breach of surface occurring. Almost always, however, ulceration takes place, the average time at which this sets in being about the ninth or tenth day, but it may commence much earlier or later than this. The ulcer is commonly the result of the death of the patch and of the membrane over it, the whole separating as a single slough or in separate irregular portions. These sloughs are yellowish or yellowish-brown from staining, or they are sometimes discolored by blood; they are occasionally seen in process of separation, hanging loosely. There may be mere superficial abrasion and softening of the mucous membrane preceding ulceration. Sometimes the glands simply rupture and discharge their contents, giving rise to a netlike appearance, and Aitken believes this is the most frequent mode of elimination of the softened deposit.

3. *Stage of Ulceration.*—The characters of *typhoid ulcers* are as follows: In length they usually vary from a line to $1\frac{1}{2}$ inch, but if several ulcers join a surface of some inches may be involved. The shape is oval or elliptical, round, or irregular, according as the ulcer corresponds to a Peyer's patch, to a solitary gland, or to several united. There is never any thickening or hardening of the edges or floor, or any morbid deposit here. The margin consists of a "well-defined fringe of mucous membrane, detached from the submucous tissue, a line or more in width, and of a purple or slate-gray color; this is best seen when the bowel is floated in water" (Murchison). The floor is formed by the submucous, muscular, or peritoneal coat, and the ulcer accordingly varies in depth. Those ulcers which correspond to Peyer's patches occupy the part of the intestine most distant from the mesentery, and their long diameter is longitudinal and not transverse, as regards the direction of the intestine.

4. *Stage of Cicatrization.*—This stage commences usually about the end of the third week, but it may be delayed considerably beyond this period, the ulcers becoming chronic or atonic. Each ulcer takes about a fortnight to cicatrize. Healing is accomplished without any puckering, contraction, or constriction of the gut. A thin transparent layer of lymph forms on the surface, by which the mucous membrane becomes

gradually attached to the floor from the periphery to the centre, and into which at last it passes imperceptibly. The cicatrix is slightly depressed, thinner at the centre than at the circumference, pale, smooth, and translucent. After a time the mucous membrane may become movable, and it is said villi may form, but if the glands are destroyed it is not likely that these become renewed.

The changes above described begin first, and are most extensive and most advanced in that part of the intestine in which Peyer's patches are most evident, viz., the lower portion of the ileum, and from this point they gradually extend upwards, until ultimately they may occupy the lower third of the small intestine. The extent of the disease is, however, very variable, the number of patches involved ranging from two or three to thirty or forty. Generally at a post-mortem examination different stages of the morbid changes are seen in different parts, being most advanced below, and it is here that the extensive ulcerations are observed. At the upper part there is usually a somewhat abrupt transition from diseased to healthy patches, and all below the first diseased patch are generally involved. The *solitary glands* are as a rule only implicated in the lower twelve inches of the gut, and they ulcerate later than the patches. They are more liable to be attacked in children.

Perforation is an event to be dreaded in connection with typhoid ulcers. It is brought about in the following ways: 1. Most frequently by molecular disintegration or an extension of ulceration, producing one or more minute, round apertures, like pinholes. 2. By more or less extensive sloughing, involving the peritoneum, the slough separating partially or completely and leaving an opening of variable size. 3. By rupture or laceration leading to an elongated perforation, and this may happen even after cicatrization has been completed. Generally there is but one perforation, but occasionally two, three, or more are observed. In most cases the opening is in the lower portion of the ileum, but it may be higher up or in the large intestines.

If a case of typhoid fever has a very long duration, it is said that the coats of the intestine, as well as the glandular structures, become considerably atrophied.

Large Intestines.—These are usually distended with gas, and sometimes extremely so. The mucous lining may be congested or softened. Deposit and ulceration not unfrequently occur in connection with the solitary glands, these morbid changes being as a rule limited to the cæcum and ascending colon. The ulcers are generally small and circular, but may be $1\frac{1}{2}$ inch long, with the long diameter transverse. In one fatal case which came under my notice, the morbid appearances were observed chiefly in the cæcum and ascending colon, where there were at least twenty ulcers, some as large as half a crown, while in the smaller intestines there were not altogether above half a dozen, and

these were confined to the solitary glands, Peyer's patches presenting but little alteration.

Absorbent Glands.—The *mesenteric glands* always present important changes, these being associated with the morbid conditions in the intestines, and being most marked in those glands which correspond to the part of the gut most diseased. They become enlarged at the very outset, not merely as the result of irritation, but from an increase in the lymphatic elements similar to that which occurs in the intestinal glands. They continue to enlarge up to the 10th or 14th day, present a red or purplish color, and feel tolerably firm. On section little opaque, pale-yellow, friable masses are sometimes seen. Subsequently these may soften into a pus-like fluid mixed with sloughs, and the glands in rare instances actually burst into the peritoneum. After the softening process begins in the intestinal glands, the mesenteric glands also soften and become smaller. Ultimately they frequently become tough, contracted and shrivelled, pale or of a gray or bluish color, and occasionally they calcify. The mesocolic glands are similarly altered when the colon is involved. Other glands may enlarge from irritation.

Spleen.—This organ is almost always much enlarged, especially in young persons, very dark in color and softened. Sometimes it contains opaque yellowish-white masses. It may be quite pulpy and has been known to rupture.

Liver and Gall-bladder.—The *liver* is sometimes congested or softened. The *gall-bladder* may be the seat of catarrhal or diphtheritic inflammation, or of ulceration. After three or four weeks the bile is often thin, watery, almost colorless, and acid in reaction.

Peritoneum.—*Peritonitis* is not uncommon, and may be either extensive or circumscribed, limited abscesses sometimes forming. It may arise from mere extension of irritation from the bowel; intestinal perforation; rupture of glands or of the spleen; or perforation of an ulcer in the gall-bladder.

Urinary Organs.—The *kidneys* are sometimes congested or have their tubes choked with detached epithelium. The mucous coat of the bladder may be congested or inflamed.

Blood and Organs of Circulation.—There is nothing very special here. The *blood* is dark and fluid and does not coagulate if there have been typhoid symptoms before death, but this is rare compared with typhus. The white corpuscles are increased, and disintegrating red corpuscles are sometimes seen. The *heart* may be a little softened.

Respiratory Organs.—There may be congestion, various forms of inflammation, œdema, or ulceration in the *larynx*, the last mentioned not being due to any specific deposit. Signs of bronchitis, hypostatic pulmonary congestion or œdema, pneumonia, or pleurisy may be evident. The *bronchial glands* are sometimes enlarged.

The *nervous system* presents no particular alterations. There may be excess of serum in connection with the brain and its membranes.

SYMPTOMS. I. Incubation Stage.—*The period of incubation* in typhoid fever is of doubtful duration. It is most frequently over ten days, and may be much longer than this. There are no distinctive symptoms. Sometimes the incubation period appears to be very short if the poison is concentrated, the disease setting in with vomiting and purging, attacking a number of persons at the same time, and giving rise to a suspicion of irritant poisoning.

II. Actual Attack.—It is scarcely possible to divide this affection into distinct stages. *Invasion* is ordinarily *very indefinite and gradual* and the patient cannot fix the exact date of the commencement of the attack. Frontal headache, with giddiness and noises in the ears; general pains in the limbs with a feeling of lassitude and illness; restlessness and disturbed sleep; slight, irregular chills; diarrhœa, with loss of appetite, furred tongue, and not uncommonly nausea and vomiting, are the ordinary symptoms. Sometimes there is much abdominal pain. Diarrhœa may be the only prominent symptom for some time. Occasionally repeated epistaxis occurs. Soon there are signs of pyrexia, increasing towards evening. It usually happens that the patient does not feel sufficiently ill to take to bed for some days, but follows his occupation, and it is not an uncommon event for patients to come to the hospital after having been poorly for many days, thinking there is not much the matter with them, and they sometimes walk about during the entire illness.

Murchison has seen cases in which at first the symptoms of typhoid fever resembled those of ague.

The disease being established, the symptoms present during the first week or ten days are as follows:

The general appearance does not indicate any great prostration, and though a certain degree of this is felt, it is not very marked. The expression presents nothing peculiar, and the face is pale, or a pink circumscribed flush may be noticed on one or both cheeks, varying in depth of tint and not constant. There is pyrexia, the skin being hot and usually dry but sometimes moist, and the pulse accelerated to 100 or 120, and sometimes weak and soft; it varies in frequency in the same patient, being readily quickened, and it is generally more rapid at night. The tongue presents usually a thin whitish fur, is moist at first, small and pointed, red at the tip and edges, with enlarged papillæ. In exceptional cases it is large and thickly coated; or red, smooth, and glazed. The lips are parched and dry, and the mouth feels slimy. There is much thirst, with loss of appetite, and often nausea and vomiting.

Abdominal symptoms are prominent as a rule. These are pain and tenderness, especially in the right iliac fossa; more or less tympanitic

distension; gurgling on pressure in the right iliac fossa; and diarrhœa. Physical examination reveals enlargement of the spleen. Sometimes intestinal hæmorrhage occurs. The diarrhœa varies in amount considerably, the stools numbering from two to twelve, twenty, or more in the twenty-four hours. Usually they are from three to six. At first they present nothing peculiar, but after a few days they have special characters, becoming thin, yellow, pultaceous, somewhat resembling pea-soup in appearance; very offensive and often ammoniacal; and alkaline in reaction. Uniform throughout when first passed, they separate on standing into an upper watery layer, of a yellowish or brownish color, containing albumen and salts in solution, the latter including chloride of sodium and carbonate of ammonia; and a lower layer or deposit, consisting of the remains of food, epithelium and mucous corpuscles, blood, small yellow flocculi, shreds of slough, and crystals of triple phosphates.

Head symptoms are not very marked at this time. Frontal headache persists, with dizziness and buzzing in the ears. Sleep is restless and disturbed, but the mind is unaffected though inactive, and there is no delirium even at night. Epistaxis is not an uncommon symptom.

The urine presents well-marked febrile characters, urea and uric acid are in excess, and chloride of sodium is diminished.

Frequently there are slight bronchitic symptoms, with dry râles over the chest.

A *specific eruption* is present in the great majority of cases, but not invariably. It is not unfrequently absent in very young patients and in persons over 30. It first appears usually from the seventh to the twelfth day, but may in rare instances be seen as early as the fourth, or not until the twentieth. The abdomen, chest, and back are the regions which it generally occupies, but it is occasionally observed on the limbs, or very rarely on the face. It does not appear all at once, but comes out in successive crops, each spot lasting from two to five days and then fading completely. The amount of eruption present at one time is never great, the number of spots rarely exceeding from twelve to twenty or thirty, and there may be but two or three. They continue to come out often until the twenty-eighth or thirtieth day, or sometimes even later than this. Murchison found the average total duration to be about $14\frac{1}{2}$ days. The eruption appears earlier and lasts a shorter time in children.

Characters.—The eruption consists of separate spots, round, lenticular, or oval in shape, and varying in diameter from half a line to two lines. They are slightly but distinctly elevated as a rule, rounded at the surface, with a well-defined margin, and having a soft feel. They have a pinkish or rose color, which throughout their whole course disappears completely on pressure, and which gradually fades away. Pe-

techiæ are never observed. In very rare instances the spots are minutely vesicular. They never persist after death.

The symptoms thus far described may continue until convalescence sets in, without any particular change, the tongue remaining moist throughout, and there being no marked prostration or severe nervous symptoms. Usually, however, the phenomena change more or less. The patient emaciates and becomes much weaker, being sometimes very prostrate. The face is more flushed, the conjunctivæ may be injected, and the pupils are dilated. The fever continues, and the pulse is more frequent but weaker. The tongue tends to become dry and brown, or red, shining, and deeply fissured, while sordes collect on the lips and teeth, the breath having a very disagreeable odor. Labial herpes is not uncommonly present. There is no diminution in the abdominal symptoms, which indeed are often intensified, and hæmorrhage from the bowels is liable to occur. The spleen also becomes larger.

The *nervous symptoms* undergo a marked change. From the tenth to the fourteenth day the headache and general pains cease, but there is more giddiness, with deafness. At the same time the mind is affected, as indicated by more or less somnolence, mental confusion, or delirium. The latter is at first only nocturnal, but may become continuous, though it is usually worse at night, while drowsiness is more marked by day. The delirium is generally of an active, noisy, and talkative kind at first, and may be very violent, the patient throwing off the bed-clothes, trying to get up constantly, and having various delusions. Sometimes the patient lies in an apathetic state, with half-closed eyes, appearing to understand what is said and done, but unable to make intelligible replies. Epistaxis is not uncommon at this time.

Sudamina often appear, usually in the third or fourth week, especially over the chest and abdomen, and on the sides of the neck. Bed-sores are liable to arise in parts which are pressed upon.

The respirations become hurried and shallow, and there are more marked signs of bronchial catarrh. The urine becomes more abundant, of lighter color, and lower specific gravity; slight albuminuria may arise, but is not very common. Sometimes the urine is retained or passed involuntarily with the stools. Rarely it contains blood, renal epithelium, or casts.

In some cases the ordinary typhoid symptoms set in, petechiæ at the same time occasionally making their appearance, but this is an exceptional course of events.

Typhoid fever when it ends in recovery presents a *gradual* subsidence of the symptoms, defervescence taking place by *lysis* and not by *crisis*. Convalescence makes slow progress, and is liable to be retarded by a *relapse*, and by complications or sequelæ.

Temperature.—Typhoid fever presents some very characteristic fea-

distension; gurgling on pressure in the right iliac fossa; and diarrhoea. Physical examination reveals enlargement of the spleen. Sometimes intestinal hæmorrhage occurs. The diarrhoea varies in amount considerably, the stools numbering from two to twelve, twenty, or more in the twenty-four hours. Usually they are from three to six. At first they present nothing peculiar, but after a few days they have special characters, becoming thin, yellow, pultaceous, somewhat resembling pea-soup in appearance; very offensive and often ammoniacal; and alkaline in reaction. Uniform throughout when first passed, they separate on standing into an upper watery layer, of a yellowish or brownish color, containing albumen and salts in solution, the latter including chloride of sodium and carbonate of ammonia; and a lower layer or deposit, consisting of the remains of food, epithelium and mucous corpuscles, blood, small yellow flocculi, shreds of slough, and crystals of triple phosphates.

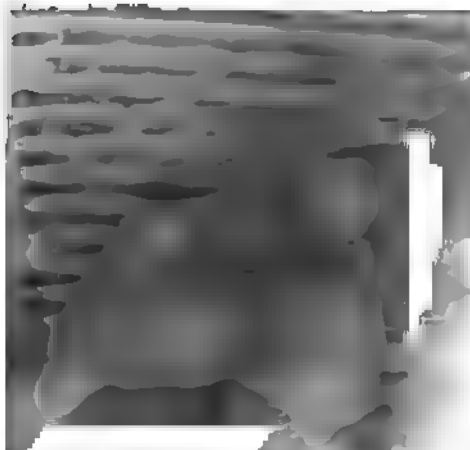
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The urine presents well-marked febrile characters, urea and uric acid are in excess, and chloride of sodium is diminished.

Frequently there are slight bronchitic symptoms, with dry râles over the chest.

A *specific eruption* is present in the great majority of cases, but not invariably. It is not unfrequently absent in very young patients and in persons over 30. It first appears usually from the seventh to the twelfth day, but may in rare instances be seen as early as the fourth, or not until the twentieth. The abdomen, chest, and back are the regions which it generally occupies, but it is occasionally observed on the limbs, or very rarely on the face. It does not appear all at once, but comes out in successive crops, each spot lasting from two to five days and then fading completely. The amount of eruption present at one time is never great, the number of spots rarely exceeding from twelve to twenty or thirty, and there may be but two or three. They continue to come out often until the twenty-eighth or thirtieth day, or sometimes even later than this. Murchison found the average total duration at 14½ days. The eruption appears earlier and lasts a shorter time in children.

Characters.—The eruption consists of separate spots, circular, or oval in shape, and varying in diameter from a few lines. They are slightly but distinctly elevated above the surface, with a well defined margin, and have a pinkish or rose color, which throughout the whole appears completely on pressure, and which



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tures as regards its temperature. The *ascent* is quite regular and gradual, and continues for four or five days. The *evening temperature* is about 2° higher than that of the morning, and there is a remission each morning of about 1° compared with the previous evening, so that there is a daily rise of about 1° , and at last the evening temperature comes to be from 103.5° to 104° . This mode of ascent is quite distinctive of typhoid.

The *stationary* period varies greatly in duration according to the severity of the case. The temperature is usually between 104° and 106° in the evenings, and only a *slight morning remission* is observed. It may even reach 107° or 108° .

The *decline* is also peculiar. It takes place gradually, and is first indicated by a more distinct morning remission; in three or four days the evening temperature falls and the morning remissions become very considerable, a difference of 2° , 3° , or even more being observed. The time taken to reach complete defervescence, so that the evening temperature is normal, varies much. Complications and sequelæ will also lead to irregularities, and a relapse may cause the temperature again to rise in the same regular manner as at first.

VARIETIES.—Remarkable differences are presented by cases of typhoid fever, both in their degree of severity and in the prominent symptoms which they present. There may be no abdominal or other characteristic symptoms from first to last, and instead of diarrhœa there may be constipation throughout.

Murchison gives the following varieties :

1. *The mild form*, under which would be included the *abortive* variety of certain writers, which ends in the second or beginning of the third week, as well as some cases considered to be of the nature of febricula.

2. *The grave form*, which according to the prominent symptoms present is subdivided into—*inflammatory, ataxic, adynamic, irritative, abdominal, thoracic, and hæmorrhagic*.

3. *The insidious or latent form*, also called *ambulatory*, because the patient often walks about during the whole attack. Sudden death may occur in such cases from perforation or hæmorrhage.

In addition to these, there can be no doubt but that the affections named *infantile remittent fever* and *gastric or bilious fever* are usually merely modified typhoid.

COMPLICATIONS AND SEQUELÆ.—Affections of the respiratory organs are apt to occur during the course of typhoid as well as typhus; those which are more common in the former than the latter being *pneumonia, pleurisy, and acute tuberculosis*. Various other complications, mentioned under typhus, are occasionally met with. Those that are specially to be dreaded in typhoid, however, are *perforation of the intestines* and *peritonitis*. The former generally happens in the third or

fourth week, but it may occur as early as the eighth day, or not until the patient is apparently almost convalescent. It is very frequent in the *latent* variety. Usually it is attended with the ordinary symptoms of perforation (to be described hereafter), but sometimes these are very obscure. *Peritonitis* may be general or local. There may or may not be prominent symptoms of this complication.

The most important *sequelæ* are phlegmasia dolens, phthisis, mental weakness, temporary general or partial paralysis, neuralgia, otorrhœa, anæmia, and a general state of ill-health, with debility and wasting. The last condition is due to destruction of the villi and glands of the intestines, and shrivelling of the mesenteric glands.

DURATION AND TERMINATIONS.—It is often difficult to fix accurately the duration of cases of typhoid, on account of its insidious mode of onset. Generally it ranges from three to four weeks, rarely extending beyond the thirtieth day. Many cases terminate on or about the twenty-first or twenty-eighth day. The mean duration of fatal cases seems to be about twenty-two days, but many run a much shorter course, and death may occur within the first few days. On the other hand the complaint may be more prolonged, and Murchison mentions an instance in which fresh spots appeared up to the sixtieth day. Complications and *sequelæ* may also protract the disease, or a *relapse*, which sometimes happens in about ten days or a fortnight after convalescence has apparently set in.

Typhoid fever may terminate in recovery, death, or a permanent state of ill-health. The average *mortality* is about one in 5.4 cases, but it differs in different epidemics. The *causes of death* are: 1. Gradual asthenia, or this combined with anæmia. 2. Direct loss of blood from epistaxis or intestinal hæmorrhage. 3. Poisoning of the blood from high fever, imperfect excretion, or absorption of septic matters. 4. Complications, especially perforation of the bowels or peritonitis.

PROGNOSIS.—Until a patient is quite convalescent after an attack of typhoid, it cannot be considered that all danger is past, and a guarded opinion should be given as to the ultimate result, even in the mildest cases. The *prognosis* is rather worse in females; in those advanced in years; and in persons who have come recently to an infected district. Family constitution seems to have some influence. Previous debility does not materially increase the danger.

Many of the conditions mentioned as being unfavorable in typhus are also unfavorable in typhoid, especially severe nervous symptoms and great prostration, but the pulse and tongue are not so much to be relied upon, and abundant eruption is not a bad sign in typhoid. The chief indications of danger are—severe abdominal symptoms, with excessive diarrhœa; intestinal hæmorrhage, especially if profuse; signs of perforation; symptoms of peritonitis; profuse epistaxis; marked muscular tremors, the mind being clear; sudden extreme prostration;

aggravation of all the symptoms after a temporary improvement in the second or third week. A relapse rarely proves fatal.

The value of the *thermometer* in prognosis requires particular notice. During the second week the temperature shows whether a case is likely to be severe or not. In mild cases a marked morning remission is observed, which begins early and increases; the evening exacerbation is late, and soon there is a permanent fall; in short the stage of deferescence sets in. In severe cases the opposite conditions are observed. The *prognosis* is unfavorable in proportion to the height of the temperature, and to the duration of this increased heat, with but slight morning remissions. Either a sudden rise or a rapid and extreme fall is a bad sign. Considerable interruption in the ordinary course of the temperature indicates the existence of complications. A marked fall often gives warning of the approach of intestinal hæmorrhage.

TREATMENT.—The remarks made with regard to the hygienic and general management of cases of typhus apply equally to typhoid, but there are some points which require special notice. Remembering the mode of origin and propagation of the poison of typhoid, every attention must be paid to the *disinfection of the stools*; to the *removal of all filth*; and especially to the *water supply*, as already described when speaking of the prevention of epidemics.

In all cases the patient should take to bed from the first, and remain there until fairly convalescent.

The greatest care is necessary as to *diet*, which should be entirely liquid, nutritious, and non-irritant, and administered at stated intervals, but not too frequently. Milk is by far the most important article of diet, but beef tea, which may be thickened with arrowroot, beef juice, and custards are also serviceable. The patient may drink toast-water, barley-water, or mucilaginous liquids, and may also have tea or coffee frequently. Fruits are not to be permitted. This caution in diet is to be observed in all cases, but especially when there is any reason to suspect extensive ulceration. By proper attention to this matter many cases may be brought safely through without the administration of any medicine whatever. Much difference of opinion has been expressed as to the employment of *alcoholic stimulants*. It is certain, however, that their indiscriminate use may do a great deal of harm, and that they are not nearly so much needed as in typhus, or at such an early period. Often they are not at all required, and it is only in the advanced stages, when the strength has been reduced and the circulation is feeble, that they are usually called for. Their effects must be closely watched.

Mineral acids and small doses of *quinine* are the general medicinal remedies most in repute in the treatment of typhoid, but they have not appeared to me nearly so efficacious as in typhus.

In the majority of cases it is the *symptomatic treatment* which calls

for the chief attention. The ordinary symptoms associated with fevers must be treated as previously described, but a few special remarks are needed with regard to the abdominal symptoms which are so often troublesome. If there is a tendency to much pain or tympanitis it is desirable to apply heat and moisture over the surface of the abdomen, assiduously and from an early period, either by means of linseed-meal poultices or fomentations. Occasionally turpentine-stupes or sinapisms are needed in order to give relief, and if pain is very severe at an early period in young and plethoric patients, it has been recommended to apply three or four leeches over the right iliac fossa, or a small blister. Opium or morphia internally may also be called for for the relief of pain.

Diarrhœa ought to be checked if it is excessive or if the patient is very weak, but it is by no means always desirable to try to stop it. Enemata of starch and opium are highly efficacious for this purpose. Internally the best remedies are Dover's powder, either alone or with carbonate of bismuth; sulphuric acid with tincture of opium; chalk mixture or bismuth, with tincture of opium and vegetable astringents. Acetate of lead, sulphate of copper, or nitrate of silver may be needed in obstinate cases.

In those exceptional cases which are attended with constipation, great care must be exercised in the use of aperients. A teaspoonful of castor oil, or a simple enema every third or fourth day, is recommended by Murchison under these circumstances.

For excessive tympanitis enemata containing turpentine or assafoetida answer best, in addition to the external applications already mentioned. Passing a long œsophagus-tube into the rectum sometimes gives much relief as regards this symptom.

Intestinal hæmorrhage, if not checked by the remedies mentioned for diarrhœa, demands full doses of tannic or gallic acid, turpentine, or tincture of iron. Ice may also be given to suck constantly, as well as applied to the right iliac region.

Should perforation occur, or peritonitis come on from any cause, the treatment should consist of absolute rest; the total withdrawal of food or its administration in very small quantities; and the free use of opium. Should constipation ensue, on no account must aperients be given.

Epistaxis sometimes requires the use of local styptics, or it may be necessary to plug the nares.

During convalescence much careful supervision is needed for some time, especially with regard to food and the employment of purgatives. The diet must be very gradually improved, and only taken in moderate quantities. It is the more necessary to insist upon this, because patients are often much inclined to indulge to excess in all kinds of food, and do not understand why they should be restricted. Wine is valu-

able at this time. If an aperient is required, a small dose of castor oil or a simple enema answers best. Tonics and change of air are very beneficial in order to promote recovery and restore strength. Cod-liver oil is also useful.

It is requisite to notice certain special modes of treatment which have been advocated for typhoid fever. 1. *Antiseptic Treatment*.—Various antiseptics have been recommended, especially carbolic acid and the sulpho-carbolates, mainly on the assumption that the disease depends upon specific organisms, which might be destroyed by the agency of these remedies. There is no adequate proof of their usefulness. 2. *Hydropathic Treatment*.—On the Continent, and particularly in Germany, typhoid has been extensively treated by means of baths or the wet-pack. Dr. Gee, in a paper in the *St. Bartholomew's Hospital Reports*, has also spoken in favor of this plan of treatment from a hypothetical point of view. It is often of much service to sponge the skin, and in cases attended with hyperpyrexia more vigorous measures of this kind are indicated, but there is no evidence that a routine hydropathic treatment of typhoid is preferable to other methods, and there are grave objections against it. 3. *Eliminatory Treatment*.—Some practitioners, instead of endeavoring to check the diarrhoea in typhoid, encourage it by means of aperients, with the view of assisting the elimination of a supposed poison. This is obviously attended with much danger.

CHAPTER VII.

RELAPSING FEVER—FAMINE FEVER.

ETIOLOGY.—Relapsing fever is an acute specific disease, originating in a *specific poison*, and it is highly infectious. Some suppose that it is identical with typhus fever, being merely a milder form of this malady, but unquestionably they are distinct diseases. Relapsing fever often spreads rapidly, and this happens the more readily where there is freedom of intercourse between the sick and healthy. Dr. De Zouche (*Liverpool Hospital Reports*, vol. v) places it next to small-pox as regards its degree of contagiousness, and observed that when it gained access into a house it usually attacked every inhabitant therein. The contagium is chiefly contained in the breath and exhalations, and as in typhus, those who come much into contact with patients are most liable to be attacked. It may be conveyed by individuals or "fomites," and clings tenaciously to a house for months. With regard to the nature of the contagium, certain organisms named spirillæ have been found in the blood in cases of relapsing fever, during the febrile paroxysms, but

they cannot be detected at the time of the crisis or in the intervals; these have been regarded as the contagium by the advocates of the germ-theory.

Predisposing Causes.—The anti-hygienic conditions which promote the spread of typhus have a similar influence in the case of relapsing fever, particularly want of food, overcrowding, and filth, and Murchison believes that it may be spontaneously developed, especially as the result of destitution. It prevails generally during periods of famine, and has hence been called famine fever. This fever is most frequently met with in the British Islands, especially Ireland. A severe epidemic occurred in Liverpool a few years since. Males are attacked in larger proportion than females, and the complaint is most common between fifteen and twenty-five years of age.

ANATOMICAL CHARACTERS.—There are no post-mortem appearances at all characteristic of relapsing fever. Petechiæ and jaundice are persistent if observed during life. The blood frequently contains much urea, and the white corpuscles are increased. Occasionally it is dark and fluid. The spleen is usually much enlarged during the febrile paroxysm and softened; sometimes it contains fibrinous deposits. The liver is also enlarged and congested, but neither this organ nor its duct exhibits any condition likely to account for the jaundice present. There may be signs of various morbid conditions of the nature of complications.

SYMPTOMS.—The *period of incubation* lasts from about four to ten days usually, but may be very much shorter, the attack even appearing to set in almost simultaneously with exposure in exceptional cases.

The *invasion* is remarkably sudden, the patient usually feeling perfectly well immediately before, and being able to fix upon the exact moment of attack. The first symptoms are often felt on awaking in the morning. Generally, however, there has been constipation for some days previously (De Zouche). The attack is commonly ushered in with a severe rigor, and a sense of great weakness, but there may be only slight shivering. Sharp frontal headache is complained of at once or very soon, rapidly increasing in intensity, with giddiness, and pains in the back and limbs, often exceedingly severe. After a variable time marked fever sets in, with dry pungent skin, flushed cheeks, frequent pulse, and excessive thirst. In two or three days profuse and general perspiration follows in some cases, but gives no relief. The rigors are repeated at intervals and may alternate with sweating, simulating ague. In children the disease may commence with a "heavy sleep." Vomiting and retching are early symptoms, the vomited matters being yellow, yellowish-green, or green, and consisting of bile and gastric secretions; sometimes they are black. Epigastric uneasiness or pain, and pain or tenderness over the liver and spleen are also complained of, these organs, especially the latter, being enlarged. Appetite is quite lost as

a rule, and there is great thirst throughout. The tongue is at first moist and covered with a white or yellowish fur, and generally remains in this condition, but it may become dry and brown, with sordes on the teeth. It is often transversely fissured and red at the edges, with enlarged papillæ. In bad cases patches of ulceration are observed on the tongue and cheeks. Constipation generally persists throughout, the stools being normal in color or dark. Sore throat is frequently complained of, the fauces being reddened and one or both tonsils enlarged.

The appearance of the patient is often quite characteristic. "The eyes appear somewhat sunken, from the dark circle which surrounds them; they are clear, but have a despairing woe-begone look, not easily to be forgotten if once seen. The whole face expresses the consciousness of pain and helplessness" (De Zouche). More or less jaundice is observed in many cases, and sometimes the skin exhibits a bronze hue. Various eruptions have been described as being met with in individual cases, but there is nothing of this nature at all specific.

The pulse rises rapidly to 100, 120, 140, or even 160. It may be full and strong, but in bad cases tends to be weak, intermittent or irregular, the impulse and sounds of the heart being at the same time feeble. The urine is febrile; it may be much diminished in quantity or suppressed, and urea is often deficient. In exceptional cases it contains albumen. Headache continues very severe throughout, with a throbbing sensation, and there is much restlessness and sleeplessness. Delirium is uncommon, but is occasionally observed, especially towards the crisis, when it may be violent.

The symptoms become intensified towards the period of the *crisis*, which event happens in most cases on the fifth or seventh day, but may take place at any time from the third to the tenth day. They are often alarming at this time and dyspnoea may be prominent. Crisis is almost always accompanied with profuse sweating, the perspiration pouring off for some hours. Sometimes sudamina appear, and occasionally watery diarrhoea or vomiting occurs. Hæmorrhages are not uncommon, especially epistaxis, and occasionally menorrhagia or hæmorrhage from the bowels. In severe cases and in weak individuals a copious and general petechial eruption is often observed at this time. The symptoms generally rapidly abate; the pulse and temperature fall even below the normal, the former frequently continuing below par; the tongue cleans; and the patient often feels quite well, only being a little weak. Most patients soon get up, and some try to work.

In exceptional cases there is not a complete cessation of symptoms, but only a partial remission. In other instances severe muscular and arthritic pains are complained of over the body generally, the metacarpal and phalangeal joints being most liable to be attacked. These prevent sleep and make the patients cry out. At this time the disease may be mistaken for acute rheumatism, especially as some of the joints

occasionally become swollen. Bronchitis may set in during the intermission, with much spasmodic cough, and expectoration of viscid tenacious mucus, or even blood; it sometimes resembles whooping-cough, especially in children.

Relapse.—Occasionally no relapse occurs, especially towards the end of an epidemic, or it is scarcely noticeable. De Zouche states that he was always able to ascertain on close questioning that a relapse had taken place. It may set in any day from the twelfth to the seventeenth, generally on the fourteenth. Its onset is equally sudden with the primary attack, and the symptoms are precisely the same, their intensity being, however, usually less, though they are in exceptional cases more severe. The average duration of the relapse is from three to five days, but it may vary from a few hours to seven or eight days, and it terminates by crisis, usually in the same manner as the first attack. A second, third, fourth, and even fifth relapse has been sometimes observed.

In rare instances extreme prostration suddenly comes on, with signs of collapse, the face being of a purplish color, especially the nose, the limbs cold and livid, the pulse very feeble, and the patient becoming unconscious. In other cases there are typhoid symptoms with suppression of urine.

Temperature.—There is a continuous ascent for four or five days without any evident morning remission, the temperature reaching 104°, 105°, 106°, or even 108°. It may then remain stationary with slight morning remissions until the period of crisis, when it falls below the normal. At the relapse it again rapidly rises, and may reach even a higher point than during the first attack; it suddenly falls again at the second crisis.

COMPLICATIONS AND SEQUELÆ.—The most important are bronchitis or pneumonia; various hæmorrhages; sudden syncope; pains in the muscles and joints, occasionally with effusion into the latter; a peculiar form of ophthalmia preceded by amaurosis; diarrhœa or dysentery; œdema of the legs, due to debility and anæmia, which also causes an anæmic murmur; parotid or other buboes; and abortion. De Zouche observed in many cases fine desquamation of the cuticle about the second week after crisis, and also falling off of the hair.

TERMINATIONS.—The great majority of cases of relapsing fever recover; in a large number collected by Murchison the mortality was only 4.75 per cent. Convalescence, however, is often tedious, and a low state of debility may be left, which may ultimately prove fatal. Death results from syncope, collapse, nervous exhaustion, excessive diarrhœa or dysentery, uterine hæmorrhage, especially after premature labor, uræmia, excessive vomiting in children, pneumonia, peritonitis, or other complications.

PROGNOSIS.—This is generally favorable, but is less so in the old, and in those lowered by disease, intemperance, or privation.

The chief signs of danger are marked jaundice; severe hæmorrhages, especially uterine; extensive petechiæ or purpuric spots; sordes and ulcerations about the tongue and mouth; incomplete defervescence after the first crisis; suppression or great diminution of urine; severe cerebral symptoms; signs of syncope; and the presence of dangerous complications. It must be remembered that serious symptoms may come on quite suddenly, even in a mild case. Convalescence is often considerably delayed on account of sequelæ.

TREATMENT.—During the first febrile paroxysm it is desirable to keep the bowels regularly open, but not to purge excessively. If the case is seen early an emetic seems to be useful. Attention must be paid to the urine, to see that excretion is properly taking place, and saline diaphoretics and diuretics may be given. A drink containing ʒj or ʒij of nitre to the pint is recommended by Murchison. Cold or tepid sponging is very useful.

Opium is a most valuable remedy to relieve headache, sleeplessness, vomiting, and the severe pains present. De Zouche found hydrate of chloral of use. He only considers it desirable to moderate vomiting if it is excessive. Other symptoms must be attended to if required.

The diet should be light and nutritious as a rule, but if the patient is low a supporting diet is indicated. Stimulants are not often required, but should be given from the first if there is much debility, if an anæmic murmur is present, or if there is any tendency to syncope. They are also called for in the case of old people and young infants who cannot take the breast, and are in most cases necessary during the exhaustion following the crisis, as well as during convalescence. Complications must be treated as they arise.

During the interval the patient should be kept in bed if possible. Various remedies have been tried to prevent the relapse, but without success. Quinine in five-grain doses may be given. The relapse must be treated on the same principles as the primary attack.

During convalescence good diet and tonics, especially quinine, mineral acids, and iron, are indicated. These seem to be the best remedies for the various sequelæ. Leeches and blisters behind the ears, calomel internally, and the local use of atropine are recommended for the ophthalmia.

CHAPTER VIII.

SCARLATINA—SCARLET FEVER.

ETIOLOGY.—Produced by a *specific poison*, scarlatina is highly infectious. This poison is especially abundant in connection with the epithelium which is shed from the skin, by means of which it may be

conveyed to a considerable distance. Infection may arise from merely going into the room where a patient is lying ill of scarlatina, or being in the same house or even in the neighborhood. The apartment also frequently retains the poison lurking in various parts for an indefinite time, unless it has been thoroughly disinfected, and therefore may be the means of originating the disease after a long interval. The infected epithelium-particles easily cling to clothes, letters, etc., and by the aid of these and other "fomites" are often carried far and wide. They are also sometimes conveyed by milk and other kinds of food. It is important to remember that insusceptible individuals may disseminate scarlatina far and wide, if allowed to pass from the sick-room and mingle with healthy persons. The disease has been produced by inoculation. Some believe that it may originate spontaneously, but this is highly improbable. A second attack rarely occurs, and still more exceptionally a third. As to the time the infection lasts in a patient there is no certainty, but it is safer to consider it as beginning with the incubation-period and not ceasing until desquamation has been thoroughly completed.

Young children are chiefly attacked from eighteen months to six years of age, but especially from three to four. In addition to the immunity afforded by a previous attack the liability to scarlatina decidedly diminishes with advancing years. Both sexes are equally affected. The complaint is more prevalent in large towns and among the poor. Cases are said to be most frequent in autumn, especially from September to November; there are many exceptions to this statement, however, and epidemics are but too common at other times.

ANATOMICAL CHARACTERS.—The changes found after death vary according to the severity of the attack and the structures involved. The ordinary anatomical characters consist of erythematous inflammation of the skin with superficial œdema, constituting the "rash;" more or less inflammation of the fauces; and congestion with catarrh of the tubules of the kidney. Various complications are also frequently met with. The spleen and mesenteric glands are not uncommonly enlarged and hyperæmic. The blood is generally deficient in fibrin and in coagulability; sometimes fibrin is in excess.

SYMPTOMS.—Scarlatina presents several varieties in its clinical history, but before alluding to these the typical form—*Scarlatina simplex*—will first be described.

I. Incubation Stage.—The *period of incubation* lasts in most cases from three to five days; it may not be longer than one or two days, or it may extend to six or eight days, but not beyond this (Squire). Generally there are no symptoms, but the child is sometimes a little ailing, languid, and restless.

II. Actual Attack. 1. *Premonitory or Invasion Stage.*—The onset is usually distinct. Chilliness is felt, but not severe rigors, followed

by pyrexia, varying in its degree, but the temperature generally rises rapidly to 104° or more. The skin feels hot and dry, the face is flushed, and the pulse very frequent. At the same time sore throat is complained of, the fauces being reddened and dry, while the neck is stiff and tenderness is felt about the jaws. Vomiting is often a prominent symptom, with much thirst and total loss of appetite. The tongue is usually furred and red at the tip and edges, with enlarged papillæ. Pains in the limbs, lassitude, frontal headache, and restlessness are generally present. There may be some delirium at night, and in young children scarlatina is sometimes ushered in by sudden convulsions or coma.

2. *Eruptive Stage.*—The rash generally appears on the second day, but sometimes it comes out within twelve hours, or not until the third or fourth day. Its primary seat ordinarily is the neck and upper part of the chest, but it spreads rapidly to the face and over the trunk and limbs. Sometimes it appears first on the legs. It begins as minute bright-red points, which speedily coalesce to form uniform patches of greater or less extent, so that large portions of the surface may be covered with the rash. The precise tint varies, but it is usually bright scarlet, or of a boiled lobster or raspberry hue, though it becomes darker as the case progresses. The color is more marked in the centre of each spot, and disappears completely on pressure, soon returning again on the removal of the pressure, being preceded by a yellowish hue. The patches are usually very distinct in the flexures of the joints. The spots are not at all elevated, as a rule, but occasionally separate ones are a little papular. The rash reaches its height usually about the fourth or fifth day from the commencement of the illness, and begins to fade from that to the sixth day, this occurring first in the parts first invaded by it. It has generally disappeared before the ninth or tenth day, and then desquamation sets in.

Sudamina are frequently present if the rash is intense, especially in adults. They are seen about the neck and chest, in the axillæ or groins, occasionally over the whole body. The skin feels dry, and often in some parts rough, owing to a condition of cutis anserina. Not unfrequently the eyelids, hands, and feet are puffy. The patient experiences a sensation of heat or burning, and there may be much itching or a sense of tingling.

State of the Throat.—There is more or less general redness of the fauces, with œdema and swelling. The surface is dry or covered with viscid mucus, and thick opaque secretion is often seen on the tonsils. These may be slightly ulcerated or the seat of suppuration. There are the usual symptoms of sore throat, with pain and difficulty of swallowing. The glands about the angles of the jaw are enlarged and painful, and the subcutaneous tissue is sometimes œdematous and puffy. The

mucons membranes of the nose and mouth, as well as the conjunctiva, are often red and inflamed.

Temperature usually continues to rise until the rash attains its height; then it remains stationary and subsides as the eruption begins to fade, either by crisis or gradually. It ranges as a rule from 104°—106° F., but may reach 107°—108°, or even higher in exceptional cases. There is a slight morning remission.

The pulse is frequent, and may reach 120, 130, 160, or more; it varies in its force, but is usually strong and full. It falls as the temperature lowers. The tongue is furred and presents a "strawberry" appearance, owing to the papillæ being much enlarged and red, projecting through the fur, and the surface may feel rough. As it cleans it is seen to be red, and the papillæ remain prominent sometimes for a considerable period. Appetite is quite lost, but there is much thirst. The bowels are usually constipated. More or less headache continues; the patient is restless and sleepless, or has some nocturnal delirium.

The urine is febrile, with sediments of uric acid and urates, which, as well as urea, are usually increased. Chloride of sodium and phosphates are diminished in quantity. Albumen is often present, and renal epithelium is visible under the microscope. Sometimes the urine contains blood.

3. *Desquamative Stage*.—The symptoms subside more or less rapidly, and then the epidermis begins to separate, the process lasting a very variable period, while the amount of desquamation also differs much, being in proportion to the intensity of the rash and the number of sudamina. The skin feels dry and inelastic before desquamation commences. It begins as a rule in those parts where the rash first appears. Where the skin is thin the epidermis comes off in small, branny scales; in other regions it forms small patches; but where the cuticle is very thick, as over the palms and soles, it peels off in extensive patches, sometimes forming a mould of the fingers or hand.

During this period the pulse and temperature frequently fall below the normal for some days. The urine is abundant and watery, deficient in phosphoric acid, and contains a considerable amount of renal and vesical epithelium. The throat may remain sore and the tonsils enlarged for some time.

VARIETIES.—Such being the ordinary course of scarlatina, it is important to point out the chief varieties which may be presented.

1. In some instances the symptoms are very trifling, the temperature not being at any time higher than 101° or 102°, and only a slight rash and sore throat being present, which soon disappear. This is a mild form of *scarlatina simplex* or *benigna*.

2. *Scarlatina Anginosa*.—In this form the condition of the throat is grave, and gives rise to severe and prominent symptoms. There is extensive and deep inflammation of the tissues, the redness tending to

a dark hue, the tonsils and uvula being much swollen, while sticky mucus and secretion cover the surface, or sometimes diphtheritic-looking patches are visible. Ulceration then often sets in, or occasionally gangrene, which may spread extensively and involve the larynx. The glands about the jaw and the other structures of the neck swell considerably, and may suppurate or even slough to a variable extent. In some cases the salivary glands are involved. Much difficulty is experienced in opening the mouth and examining the throat, which is very painful, while swallowing is exceedingly difficult and distressing, and fluids are liable to enter the posterior nares during the act of swallowing. The breath is extremely disagreeable.

The rash is usually delayed in its appearance, is less marked or diffused, disposed to fade and return again, and its final departure is later than usual.

Often there is much swelling of the nasal mucous membrane, with offensive and irritating discharges from the nostrils or blocking up of these by secretions. The mouth and lips are also sore and cracked, and the tongue has a darker hue than in ordinary cases.

The general symptoms are prone to be of a low type, this being partly due to interference with respiration and absorption of putrid matters from the throat. When adynamia is very marked from the first, the variety is sometimes named *scarlatina anginosa maligna*.

Nausea, vomiting, diarrhoea, with irritating discharges, and tympanitis may result from swallowing acrid matters.

If a case terminates in recovery, the temperature continues high after the rash has disappeared, owing to the state of the throat.

3. *Scarlatina Maligna*.—As already stated the symptoms may take on an exceedingly ataxic or malignant character in connection with a bad state of the throat, and the same thing may happen during any severe attack of scarlatina, especially if the patient is previously in a weak, unhealthy condition. Nervous symptoms are prominent from the first. There is much prostration, with restlessness, insomnia, muttering delirium, followed by convulsions, stupor, or coma. The pulse is very feeble, rapid, small, and irregular; the circulation is impeded, as evidenced by duskiness of the face and capillary congestions in dependent parts, while petechiæ are frequently observed, and sometimes hæmorrhages occur. Respiration is much hurried. The tongue is dry and brown.

An important class of malignant cases are those in which there is extreme prostration from the first, with intense nervous depression, the poison seeming to act powerfully upon the nervous system. The child becomes faint and sick, is pale and cold or almost collapsed, exhibits great restlessness and anxiety, and may be delirious. The pulse is extremely rapid, weak, small, and irregular. The depression speedily increases, the face becomes very pale, livid, or mottled, and coma or

convulsions set in. The breathing is quick and irregular. The skin is cold, or alternately hot and cold, and clammy perspirations break out. Death may take place before the eruption has time to appear, or a slight irregular rash comes out if the child lives long enough.

Several cases of this character are sometimes met with in the same family, its members being rapidly carried off one after another.

4. *Scarlatina sine eruptione*.—In some cases there is fever and a sore throat, but no eruption appears. This is liable to happen in second attacks.

5. *Latent*.—There may be no symptoms whatever, and the fact of a patient having suffered from scarlatina may be known only by desquamation of the cuticle taking place, or albuminuria and dropsy setting in.

In addition to these varieties, others have been described depending upon the characters of the eruption, such as “*papulosa*,” “*variegata*,” “*pustulosa*,” “*pemphigoidea*,” etc.

COMPLICATIONS AND SEQUELÆ—1. The most frequent and important and the one that requires special notice is *acute desquamative nephritis* and its consequences. Some look upon this as part of the disease. It is imperative in all cases of scarlatina to examine the urine at frequent intervals, even for some time after apparent convalescence. There is often a certain amount of albuminuria as in other febrile diseases, and the kidneys are always in a state of congestion and catarrh, but these conditions disappear as the fever subsides. The renal complication generally appears during or after desquamation, and though exposure to cold seems to excite it in some instances, as a rule it comes on quite independently of any obvious cause. It is due to the deficient action of the skin, which involves excessive action on the part of the kidneys, these having at the same time to remove large quantities of waste products. Probably the scarlatinal poison itself has some influence in destroying the renal epithelium. The symptoms are similar to those of ordinary acute Bright's disease, scarlatina being in fact one of the most frequent causes of this affection. The urine is diminished or suppressed, concentrated, contains more or less blood, is very albuminous, and presents blood-corpuscles, renal epithelium, and epithelial, blood, or granular casts under the microscope. Dropsy sets in, beginning usually in the subcutaneous tissue, and it may spread rapidly, involving the serous membranes, larynx, and lungs in some cases. More or less pyrexia is usually present, and frequently vomiting, constipation, headache, and drowsiness; while there is a danger of uræmic symptoms setting in.

The symptoms may subside and disappear, or a form of chronic Bright's disease may be left. In some instances this complaint seems to commence as a chronic affection.

The remaining *complications* or *sequelæ* calling for notice are: 2. Dropsy without albuminuria, and having no obvious cause. 3. Ulce-

ration of the throat, either a continuation and extension of that originally present; or a new form, spreading rapidly with much sloughing, and affecting the tissues of the neck widely. Pus may find its way into the chest, or the vessels of the neck may be opened causing fatal hæmorrhage. 4. Affections of the joints, either of a rheumatic character, or ordinary inflammation occasionally ending in suppuration or chronic disease. The inflammation is sometimes around rather than in the joints, and it may be in connection with muscles. 5. Serous inflammations with a tendency to the formation of pus, especially pleurisy and pericarditis, being usually but not necessarily dependent upon renal disease or rheumatism. 6. Bronchitis and pneumonia, and possibly phthisis. 7. Endocarditis, which it is highly probable may lead to permanent organic affections of the valves and orifices of the heart. 8. Affections of the ear. These are by no means uncommon, and include otorrhœa; inflammation of the tympanum ending in suppuration, followed by rupture of the tympanic membrane; inflammation or ulceration of the Eustachian tube, with subsequent closure and consequent deafness; necrosis of the bones, which may cause meningitis, abscess in the brain, or facial paralysis. 9. Abscesses in various parts, especially in connection with glands. 10. Gangrene occasionally. 11. Inflammation and destruction of the cornea in rare instances.

PROGNOSIS.—The number of deaths from scarlatina varies greatly at different periods, but the mortality from this disease is considerable every year. A careful prognosis should always be given, and account must be taken of the possible complications and sequelæ. The complaint is most fatal among very young children, and in large towns. The chief circumstances which render the prognosis grave, are a severe epidemic type of the disease; family predisposition to a fatal termination; great depression at an early period; typhoid symptoms at any time; late development of, or a tendency to duskiness in the eruption, especially if accompanied with petechiæ or hæmorrhages; prominent nervous symptoms; extensive sloughing or ulceration about the throat, and other severe complications of this character; renal inflammation and its results; and severe diarrhœa or vomiting. Special allusion must be made to pregnancy. The occurrence of scarlatina during this condition is extremely dangerous, and life may be destroyed in a few hours.

TREATMENT.—In the first place the general treatment for the prevention of infection must be carried out in every particular in cases of scarlatina, and it is always advisable to keep patients under observation, and to exercise every precaution until desquamation has entirely ceased and all chances of the development of the renal complication have passed away.

In ordinary cases but little medicinal treatment is required. The bowels should be acted upon occasionally, and some saline mixture

may be administered, such as a solution of citrate of potash. Barley-water, lemonade, or iced water may be given freely as a drink, and a diet of milk and beef tea allowed. The skin should be carefully sponged with lukewarm water twice a day, different parts being exposed in succession and then dried. Some recommend that oil and grease should be rubbed in, and others advocate the addition of a little carbolic acid, Condyl's fluid, or camphor, to act as disinfectants. When the fever and rash have subsided, warm baths ought to be used about every other day, and the patient should be well scrubbed with carbolic acid soap, in order to get rid of all the epithelial scales.

Some of the principal conditions which call for active interference will now be considered.

The throat symptoms are best relieved in ordinary cases by sucking ice or inhaling steam. If there is much redness and swelling these measures should be steadily persisted in, or the throat may be gargled frequently with lukewarm water, if the patient is old enough to do this, heat and moisture being at the same time applied externally over the neck. It may possibly be advisable to apply a few leeches about the angles of the jaw, but very seldom. For ulceration and gangrene antiseptic gargles should be freely used, or if these cannot be employed the application may be made in the form of a spray. The best antiseptic remedies are carbolic acid, creosote, chlorate of potash, Condyl's fluid or sulphurous acid; some prefer chloride of lime, chlorine water, dilute hydrochloric acid, common salt, or peroxide of hydrogen. It may be requisite to touch ulcers with nitrate of silver or its solution.

If the throat is in a bad condition it is most important to attend to general treatment. Nourishing food, in the form of soups, meat extracts, milk, etc., as well as stimulants, especially port wine or brandy, must be given more or less freely in proportion to the state of prostration of the patient, which is often considerable in these cases. At the same time tincture of steel should be administered in full doses, alone or combined with quinine. Different authorities recommend ammonia and bark, carbolic acid and sulpho-carbolates, creosote, hypochlorite of soda, or the hyposulphites, under these circumstances. Chlorate of potash should be allowed freely as a drink. When the nostrils are blocked up, and there is much nasal secretion and discharge, it is well to wash out the meatuses occasionally with weak disinfectant solutions, or a weak solution of nitrate of silver may be required.

The other conditions which are likely to call for attention are hyperpyrexia, adynamic symptoms, restlessness, sleeplessness, or delirium. These must be treated as in other febrile diseases.

Complications and sequelæ often require special treatment, but here allusion can only be made to the management of the renal affection. This should be combated by free dry cupping over the loins, or it may even be advisable to take a little blood from the renal region; hot poul-

tices over the same region, frequently changed; hot air or vapor baths, in order to excite skin action; purgation by means of jalap and cream of tartar; and a plentiful supply of diluent drinks. When the acute symptoms have subsided, some preparation of iron is most valuable, especially the tincture; quinine is also a useful remedy.

For those extremely malignant cases of scarlatina which are attended with early and severe cerebral symptoms, no treatment is of much avail, for they generally prove fatal. The use of a hot mustard-bath or cold water affusion seems likely to do most good. A blister may be applied to the nape of the neck, and stimulants administered by enemata.

CHAPTER IX.

RUBEOLA—MORBILLI—MEASLES.

ETIOLOGY.—Measles is decidedly infectious, especially when the eruption is out, and its contagium passes off abundantly in the exhalations of a patient, the air around being thus contaminated. It is also conveyed by "fomites." Children have taken the disease from sleeping in a bed or room previously occupied by a patient suffering from measles. Inoculation has been accomplished through the blood and secretions. A second attack very rarely occurs.

Children are most frequently affected, but those only a few months old often escape during an epidemic, while no age is exempt. Epidemics are more liable to occur during cold and damp seasons.

ANATOMICAL CHARACTERS.—The chief of these is the specific eruption, but this often disappears to a great extent after death. It is due to hyperæmia of the skin with some inflammatory exudation, and in some forms minute extravasations of blood occur. More or less bronchitis invariably sets in, but in fatal cases it is usually extensive and of the capillary variety, being associated with collapse of the lung and lobular pneumonia. Laryngitis is not unfrequently present. The blood is dark and fluid in fatal cases.

SYMPTOMS.—1. *Incubation Stage.*—This generally lasts about eight days after exposure to infection. By inoculation measles has been produced in seven days. Out of 50 cases published by Dr. Squire 45 had full rash from the tenth to the fourteenth day; in only one case was it earlier than this, and in another it was delayed to the eighteenth day. Subtracting four days from these, this will give six to fourteen days as the extremes of the incubation period. As a rule there are no symptoms during this stage.

II. *Actual Attack.* 1. *Premonitory Stage.*—Measles usually sets in

somewhat suddenly, with chilliness, actual rigors, or occasionally convulsions. Then follow the ordinary symptoms of pyrexia, but not of great severity in the majority of cases, though the temperature rises rapidly to 101° or 102° , and now and then to 104° . The child is languid, irritable, and restless, or may be somewhat delirious at night. The most striking symptoms are those of so-called catarrh. The eyes are injected and watery, with a feeling of soreness and sandiness and a dislike for light, the eyelids being also red and tumefied. There is a constant irritating watery discharge from the nose, with frequent sneezing, and occasionally epistaxis takes place. A sense of tightness, fullness, or pain is experienced over the frontal sinuses. The throat is generally a little sore and red, and the voice somewhat husky or hoarse, but these symptoms are not prominent. Bronchial catarrh is indicated by a sense of tightness and uneasiness over the chest, frequent cough, quick breathing, and wheezing or dry rhonchal sounds or rhonchal fremitus. A little epigastric pain and tenderness is sometimes complained of, or even general abdominal pains, and there may be much vomiting. The bowels are generally constipated, but may be relaxed.

2. *Eruptive Stage.*—The rash makes its appearance in most cases on the fourth day, but may come out from the first to the seventh or eighth. It begins usually on the face, especially on the forehead, then spreads to the trunk, and lastly to the limbs, appearing in these parts in almost distinct crops on three successive days, but occasionally it is first evident on the limbs. Commencing as small scattered red points, these enlarge to the size of a millet-seed or small pea, and become perceptibly raised and papular, eventually being flattened at the summit. They are distinct to the touch and sometimes have a hard feel.

The eruption tends to form patches of a crescentic, semilunar, or irregularly circular shape. In some cases it is so abundant as to form extensive irregular but well-defined patches, almost uniformly red, but with elevations upon them; in others it is only sparsely scattered, especially on the limbs, or it may be limited to the face and upper part of the chest. The tint is variously described as rose-colored, dark raspberry, lilac, and yellowish-red. It is more marked and brighter on exposed parts, such as the hands and face. Pressure removes it temporarily, leaving a slight yellowish hue. If the rash is very intense minute vesicles may form, and small petechial extravasations are sometimes observed. It goes on increasing for about twelve hours and then declines in the same order in which it appeared, the elevations subsiding and only a reddish or coppery discoloration remaining, the latter continuing for some time. The cuticle desquamates slightly, separating in the form of fine powdery scales, especially on the face and where the eruption has been considerable; rarely does it come off in patches. Occasionally the eruption suddenly recedes.

During the height of the rash the face and hands are often somewhat

puffy and swollen. There is frequently much itchiness and irritability of the skin.

The catarrhal symptoms generally increase during the progress of the eruption to its height. The conjunctivæ and mucous membrane of the nose, mouth, and throat are more or less inflamed, and various discharges escape, or ulceration is occasionally excited. Deafness is now and then noticed, owing to the Eustachian tube being involved. The tongue is much furred, usually moist, and presents a few enlarged and red papillæ; it cleans in patches; sometimes it tends to be dry and brown. Vomiting and diarrhœa may be prominent and persistent symptoms.

The chest-symptoms and physical signs indicate more or less extensive bronchial catarrh, the cough becoming moist with muco-purulent expectoration, and rhonchal fremitus with various rhonchal sounds being perceived.

The *temperature* increases up to the height of the rash, especially during the later period, there being, according to Dr. E. Fox, a fall before the commencement of the eruptive stage. It does not usually reach above 103°. Morning remissions may be slight, marked, or absent. Defervescence takes place from the fourth to the tenth day, as a rule by a rapid *crisis*, the temperature falling 2°, 3°, 4°, or even 5° in 12 hours. After one or two slight evening exacerbations the temperature becomes normal or falls even below this point for a few days. In rare instances the temperature rises to 108° or 109°. It must be remembered that it is much influenced by complications.

The urine is febrile and abundant lithates are deposited on standing; it has a peculiar odor; not uncommonly there is slight albuminuria, and sometimes blood is passed. The sweat and breath are said to have a peculiar smell.

VARIETIES.—The *varieties* of measles are: 1. *Morbilli mitiores, vulgares, or simplices*.—This is the ordinary form already described. 2. *Sine eruptione*.—Sometimes there is fever and catarrh but no eruption. 3. *Sine catarrho*.—There may be no catarrh, and occasionally even pyrexia is absent, so that the disease is merely indicated by its eruption. 4. *Graviores, malignant, black, or hæmorrhagic*. This form may depend upon epidemic influence, or upon the unhealthy state of the patient. At first the symptoms may be mild, or they assume a virulent aspect from the outset. This variety is characterized by typhoid symptoms; severe nervous disturbance; and irregularities in the eruption. There is great depression and prostration, with a very weak, frequent, and irregular pulse, cold extremities, a dry and brown tongue, and sordes on the teeth and lips. Twitchings, picking at the bed-clothes, convulsions, delirium of a low and muttering character, or stupor, are generally observed at a very early period. The eruption comes out only slightly and irregularly, often receding and reappear-

ing. It is distinctly livid, purple, or black, being mixed with abundant petechiæ, especially about the legs; sometimes hæmorrhages take place. Extensive bronchitis, pulmonary congestion, or pneumonia is liable to set in. Death usually occurs from asthenia, coma, or asphyxia.

COMPLICATIONS AND SEQUELÆ. 1. These include: *Affections of the respiratory organs* more especially, which may become dangerous during or subsequent to the attack of measles. They comprise acute laryngitis, croupous or diphtheritic; chronic laryngitis; capillary bronchitis; chronic bronchial catarrh; lobular collapse; croupous pneumonia; catarrhal or broncho-pneumonia; acute or chronic phthisis; very rarely gangrene. 2. A low state of the general health. 3. Acute tuberculosis. 4. Inflammation about the eyes, nose, or ears, tending to become chronic, and being accompanied with discharges. 5. Inflammation of the glands of the neck and other parts, which may remain permanently enlarged. 6. Severe diarrhœa, which may become chronic. 7. Acute Bright's disease rarely. 8. Diphtheritic or gangrenous inflammation of the labia in exceptional instances.

PROGNOSIS.—As a rule the immediate prognosis of measles is favorable, but the number of deaths varies much in different epidemics. The mortality is greater in old persons; in large towns; and during cold and damp seasons. The chief sources of danger are the pulmonary complications. The malignant variety is necessarily exceedingly dangerous, and should recovery take place convalescence is much delayed. The sequelæ which are liable to occur after measles must be borne in mind when giving a prognosis.

TREATMENT.—Decidedly the principal thing to attend to in the majority of cases of measles is to ward off any dangerous complications in connection with the respiratory organs. This is best carried out by keeping the patient in bed, in a room at a uniform temperature of from 60° to 65° F., according to the time of the year, into which steam from a boiling kettle may be admitted. All exposure to draughts must be carefully avoided until the entire course of the fever has been passed through, and the bronchitic symptoms have subsided. The patient must remain quiet, and it is well to darken the room somewhat. Only a liquid diet should be given, but it need not be too low. The bowels must be kept regularly open by mild aperients. A mixture containing liq. ammon. acetatis; vin. ipecac.; a few drops of tinct. camph. co., if the cough is very troublesome; with mist. camph. may be administered. If there is much oppression and sense of tightness about the chest, a sinapism or hot poultices or fomentations should be applied. Thirst is to be alleviated by ice or small quantities of acid drinks. If there is much heat and discomfort about the skin, careful sponging with tepid water may be resorted to, only a limited surface being exposed at the same time. Should the bronchitis become extensive, tending to in-

volve the smaller tubes, it is best treated by giving vin. ipecac. in good doses; avoiding all opiates; encouraging cough; and applying linseed-meal poultices or sinapisms freely over the chest. Local removal of blood may now and then be indicated in plethoric children. In most of these cases, however, stimulants are called for, such as ammonia and chloric ether, with more or less wine or brandy and plenty of liquid nourishment, administered in small quantities at frequent intervals. If signs of suffocation appear, mustard baths or warm baths with cold douching should be resorted to, as well as artificial respiration. All forms of pneumonia require a stimulant treatment.

Laryngeal symptoms should be treated by the constant application of heat and moisture externally, and the use of inhalations of steam. Other complications must be attended to should they arise.

Any tendency towards the typhoid condition must be combated by the free use of stimulants and nourishing food. If the eruption suddenly recedes, it is recommended to try to bring it out again by means of various baths and warm drinks internally, but this must be done with caution.

During convalescence it is necessary to exercise much care for some time; to guard against colds; and in order to restore the health fully it is often advisable to give quinine and iron with cod-liver oil, and to recommend change of air to a suitable climate, with cold bathing, especially with salt water. The clothing must be warm, and flannel should be worn. Sequelæ not uncommonly require attention.

CHAPTER X.

RÖTHELN—RUBEOLA NOTHA—GERMAN MEASLES.

It is necessary to consider briefly an affection to which the above names have been applied, the existence of which is by no means sufficiently recognized in this country.

ETIOLOGY.—Rötheln has been regarded either as a mild form of measles or scarlatina; or as a combination of these two diseases, and hence termed "hybrid measles" or "hybrid scarlatina." There is abundant proof, however, that it is quite distinct from both these complaints, though resembling them in many of its features, and that it is undoubtedly an independent *acute specific fever*, propagated by a *specific contagium*. Dr. Living believes that rötheln is far less contagious than either measles or scarlatina, but that it is more distinctly epidemic, at least in this country, even than ordinary measles, and certainly more

so than scarlatina. The contagium probably comes off in the breath and cutaneous exhalations. Adults may be attacked as well as children.

SYMPTOMS.—I. Incubation Stage.—This usually lasts about twelve days, but may extend to twenty days. There are no symptoms.

II. Actual Attack.—1. Invasion Stage.—Rötheln is ushered in with slight shiverings, pains about the body and limbs, and pyrexia, while sore throat is almost always complained of, which differs from that of scarlatina in being much less severe, very seldom going on to ulceration. In many cases, but not nearly so frequently as the sore-throat, signs of catarrh are present as in measles. The intensity of the symptoms is generally comparatively mild, and not uncommonly they are quite insignificant, though on the other hand they may be rather severe, the temperature running up to 103° or more in some instances.

2. Eruptive Stage.—The eruption, which is in the form of a "rash," comes out generally on the second day or even within the first twenty-four hours; it may be delayed, however, until the third or fourth day. Its amount is usually in proportion to the intensity of the early symptoms. It appears more or less simultaneously over the body, but is less marked on the limbs than elsewhere. At first the rash resembles that of measles, consisting of a number of minute red papules which become grouped in patches, but these are more irregular and less distinctly crescentic than those observed in measles. The color is also rather brighter than in this disease, and it is deeper at the centre than towards the circumference of the patches. In some instances these coalesce either partially or completely, so that the skin is uniformly red over a greater or less extent of surface, and then the rash becomes more like that of scarlatina. The eruption lasts longer than that of either measles or scarlatina, its duration being never less than four or five days, and may continue for eight or ten days. Slight desquamation of the cuticle follows, but this is never a prominent feature, being merely of a furfuraceous character. When the rash appears the general symptoms abate considerably in most cases, but the sore throat persists, being often the last symptom complained of and continuing sometimes for several days after the rash has disappeared.

Rötheln seems to be unattended by any particular complications or sequelæ as a rule. Slight albuminuria is not uncommon, but it soon passes away. In rare instances acute renal disease with dropsy sets in.

PROGNOSIS.—This is highly favorable, death from rötheln being an exceedingly rare event, while recovery is usually speedy and complete.

TREATMENT.—All that is needed is to keep the patient in bed; give a liquid diet; and administer an aperient if necessary, with some simple saline mixture. If the throat be very sore it may be gargled with milk and warm water.

CHAPTER XI.

VARIOLA—SMALL-POX.

ETIOLOGY.—The *specific poison* which generates small-pox is very easily conveyed from one individual to another by inoculation, contact, and infection. It exists in the blood, in the contents of the eruption as well as in the substance of the dried scabs, and is also given off abundantly in the various secretions, excretions, and exhalations, especially those emanating from the lungs and skin. Inoculation can be accomplished through the blood, and very effectually through the serum, pus, or dried scabs of the eruption. Small-pox is one of the most infectious diseases, and the contagium can be conveyed to considerable distances. It is exceedingly dangerous to be in the vicinity of a patient suffering from this disease even in its mildest form, as this may induce the most virulent type. The poison clings tenaciously to "fomites," especially to clothes and other articles of a rough texture, and retains its vitality for a long period; therefore it is most dangerous to go into a room which has been occupied by a small-pox patient until this has been most thoroughly disinfected, while clothing and other articles will certainly propagate the disease unless treated in the same manner. There can be no doubt but that the disease has been not uncommonly propagated by cabs. I have known several instances in which persons suffering from mild variola have come as out-patients to hospitals, and as they may remain for some time among the other patients, it is not at all improbable that the affection is sometimes disseminated in this way.

Experiments have been made by Burdon-Sanderson and others in order to try to discover the exact nature of the contagium of small-pox, and it has been supposed to consist in certain minute particles which are present in the contents of the eruption. Klein has described peculiar organisms which he has found in connection with sheep-pox, which is identical with small-pox.

The safer conclusion as regards the time during which infection lasts is to consider it as beginning with the earliest appearance of symptoms, and continuing for some time after the eruption has disappeared. The danger is greatest during the period of suppuration. It is very important to bear in mind that the bodies of those who have died from small-pox may undoubtedly convey infection. A second attack is only rarely met with, but even a third may occur.

Variola may be met with at any age. It attacks most commonly and most severely those who have either not been vaccinated at all or only

inefficiently. Constitution and race seem to influence its occurrence and characters. Some individuals resist all infection and cannot even be inoculated. The negro and dark races generally suffer severely. Dread of infection is said to act as a predisposing cause. The lower classes suffer most, for obvious reasons.

ANATOMICAL CHARACTERS.—The eruption is the result of circumscribed inflammation of the skin, extending more or less deeply. There is first congestion, which some believe begins in the follicles of the skin. Then the papillæ enlarge, and the cells of the rete mucosum increase, thus giving rise to papules. A layer of soft whitish exudation is described as forming between the cuticle and the true skin, which is due to proliferation of the cells of the rete mucosum. Next a clear fluid collects beneath the superficial layer of the epidermis, a vesicle being thus formed, and after this pus is produced. The pustules either rupture or dry up. The true skin may be extensively involved and destroyed. Mucous surfaces are not uncommonly affected, especially the conjunctiva and mucous membranes of the mouth, throat, and nose. Occasionally the whole extent of the respiratory or alimentary-mucous tract is involved. There may be merely inflammation, or it is said the specific eruption is sometimes observed. Other mucous surfaces are also implicated, and the eruption has been described as occurring even on serous surfaces. Various organs are often inflamed, as well as serous membranes, especially the pleuræ, and the exudations are liable to be sanguineous. The heart, kidneys, liver, and muscles generally are soft and the seat of fatty degeneration. Putrefaction proceeds rapidly after death.

SYMPTOMS.—I. *Incubation Stage.*—After inoculation of the small-pox virus, the first symptoms appear in seven days. When communicated by infection the incubation period is almost always twelve days, but it may be a day or two longer or shorter. During this period there may be some feeling of general illness, but no definite symptoms are noticed.

II. *Actual Attack.* 1. *Premonitory or Invasion Stage.*—Small-pox usually commences suddenly, with chills or repeated and well-marked rigors, followed by pyrexial symptoms, constituting the *primary fever*. The temperature rises rapidly and may reach 104° or 106° before the eruption appears. Along with the usual symptoms of fever, which are generally severe, there are others of a very significant character, viz., a feeling of marked uneasiness and fulness or actual pain in the epigastrium, with nausea and more or less obstinate vomiting; pains over the body generally, but especially in the middle of the back opposite the lower dorsal, lumbar, and sacral regions, this pain not being aggravated by movement; and considerable debility and sense of illness, with tremulousness of the muscles. Even in mild cases it is often remarkable how prominent these symptoms are. Much headache is usually complained of, while the face is flushed and the carotids throb. In some cases the

disease sets in with violent nervous symptoms, such as restlessness, delirium, somnolence, stupor, coma, or convulsions, the last being particularly frequent in children. Occasionally there is considerable sore throat or coryza. The severity of the symptoms at this period is generally in proportion to that of the subsequent stages.

2. *Eruptive Stage*.—The eruption appears usually during the third day, but may be delayed until the beginning of the fourth. The face is almost invariably its primary seat, especially the forehead, but in rare cases it commences about the wrists. It spreads over the body and limbs in from one to two days, and is described as forming three successive crops. The number of spots or "pocks" varies from just a few to thousands, but as a rule from 100 to 300 are present. On the face they are more abundant than elsewhere. They may be distinct or run together in different ways, thus giving rise to certain varieties which will again be alluded to.

If a typical individual pock be observed it will be found to go through the following course. It starts as a minute bright-red spot, a little raised; enlarging and becoming more elevated, it forms a distinct papule on the second or third day, well-defined, flattened at the top, and having a peculiar solid, hard, dense feel, compared to that of a shot or mustard-seed under the skin, which is very characteristic. This soon changes into a vesicle, a little clear thin fluid collecting in the centre under the epidermis. About the fifth day a depression forms on the top of the pock, which thus becomes umbilicated; at the same time the contents gradually become purulent, this change beginning at the circumference, the central part still for some time remaining vesicular, and this vesicle is stated to be distinctly separated from the surrounding pus by a transverse partition, so that the two portions may be severally emptied of their contents. The pus is formed by softening and liquefaction of a white substance formed by an increase in the cells of the rete mucosum, which finally become pus-cells. At this time a distinct ring of inflammatory redness appears around each pock. The pus increases in quantity, and after awhile the umbilication disappears, the pock becoming either rounded or pointed at the top. Its interior is divided into a variable number of areolæ or compartments, sometimes regularly arranged and of equal size, but usually irregular and unequal, the partitions being formed by the white substance already mentioned. With regard to the cause of the umbilication, it has been attributed to the passage of a gland-duct or hair-follicle through the pock; or to a central organic connection between the epidermis and cutis, which finally gives way.

About the eighth day the pustule is at its height, and has arrived at the end of the stage of maturation. Then it undergoes retrograde changes. It either ruptures, its contents being discharged and drying up so as to form a yellowish-brown scab; or it shrivels and dries up

without rupturing. The scab separates from the eleventh to the fourteenth day, leaving a stain of a reddish-brown color, which remains for a variable period. If the cutis is at all destroyed a pit is left of greater or less depth, which ultimately becomes of a dead-white color.

The course thus described is modified by circumstances which will be alluded to presently. It is generally completed on the face before other parts of the body.

The appearances and symptoms associated with the eruption will vary according to its amount. If it is at all considerable there is tumefaction and puffiness of the scalp, face, neck, and other parts, accompanied with a sensation of throbbing and tightness. The eyelids may be so swollen as to be completely closed. The skin is generally of a deep-red color between the pocks, and feels more or less sore and tender. There is usually most uncomfortable itching, which induces patients to scratch themselves, thus causing much soreness and ultimate disfigurement. A characteristic, unpleasant, sickly odor is exhaled from the body.

The eruption not unfrequently involves the mucous membrane of the mouth and throat, being accompanied with soreness, salivation, and dysphagia. There is a discharge from the nostrils, or these are blocked up. Sometimes the larynx, trachea, and bronchi are involved, as indicated by hoarseness, cough, and more or less dyspnoea. The urino-genital mucous membrane is often affected, causing much pain and soreness with dysuria, and sometimes hæmaturia. It is said that the eruption may even be met with in the rectum, or along the whole course of the alimentary canal, but this is doubtful. Diarrhoea is not an uncommon symptom.

The conjunctiva is frequently in an irritable and inflamed condition, and hence there is a burning sensation about the eyelids, with inability to bear the light, and increased secretion of tears. Occasionally a pustule forms on the ocular conjunctiva, which may lead to ulceration and destruction of the cornea.

Secondary Fever.—When the eruption appears the primary fever abates rapidly, so that the temperature falls nearly or quite to the normal in moderate cases, the patient feeling as if convalescent. When suppuration commences, however, *secondary* or *symptomatic fever* sets in, depending upon and being in proportion to the inflammation of the skin, and subsiding as this subsides. It often begins with rigors or chills. The pulse is frequent, and there is much thirst, with dryness of the tongue and mouth. The temperature rises to 104° or 105° F. in a typical case, reaching its maximum when suppuration is at its height, but it may be considerably above this. Defervescence is gradual, and there may be another elevation of temperature when desiccation occurs.

The urine is febrile so long as the pyrexial condition lasts; sometimes it contains a little albumen; in bad cases blood is mixed with it.

VARIETIES. 1. *Discrete*.—In this variety the pocks are distinct and do not run into each other, though some of them may touch. They are never numerous, and there may be but a few scattered about. The symptoms are usually mild, but their severity depends upon the amount of the eruption.

2. *Confluent*.—This is a very serious form, in which the eruption is abundant and the pustules run into each other. The symptoms of the invasion stage are severe, and nervous symptoms are often prominent. The eruptive stage commences earlier, and there is not at this time such a distinct remission in the fever as is observed in ordinary cases. The eruption is often preceded by erysipelas or erythema. Very numerous papules appear, small and but slightly prominent, arranged in groups or irregularly, and they rapidly spread over the whole body. The course of the eruption is more rapid than usual, the vesicular and pustular stages being soon reached. The pustules present variable appearances, but they are often extensive and flat, and there may be large bullæ filled with pus. The face is sometimes "as if covered with one bladder of matter." The contents are in some cases serous and watery or bloody and very offensive. Frequently there is no red areola around each pustule, but the skin generally is of a dark-red color. Extensive crusts form after desiccation, often of a dark color and soft, which do not separate for some time. Confluence is usually most evident and most serious about the scalp, face, and neck; the face may ultimately be covered with a continuous crust like a mask. The true skin is destroyed more or less, and extensive pits, scars, or seams are left, which tend to contract, thus causing great disfigurement. The eruption is generally abundant on the mucous surfaces, giving rise to the various symptoms already mentioned.

Secondary fever does not stand out so distinctly in the confluent as in the discrete variety of small-pox, and adynamic symptoms are apt to set in, with intense nervous depression. Complications and sequelæ are also very liable to arise, many of them of a serious and dangerous character. This form is exceedingly fatal, and if recovery takes place convalescence is generally very slow. Occasionally, however, cases of confluent small-pox are met with which run a remarkably favorable course.

3. *Semi-confluent or Coherent*.—This is an intermediate variety, in which the pocks are not quite distinct but do not actually run into each other. It is not a dangerous form.

4. *Corymbose*.—Here the eruption is arranged in clusters like bunches of grapes, and it exhibits a tendency to symmetry. It is said to be a very dangerous and fatal variety.

5. *Malignant*.—Under this term several forms which are occasionally

observed may be included. In some instances an individual is attacked with severe primary fever attended with low symptoms, and dies from the intensity of the action of the poison before the eruption can appear. Other varieties of malignant small-pox are named *black* or *hæmorrhagic*, *petechial*, *ulcerative*, and *gangrenous*, these terms sufficiently indicating their nature.

In the *hæmorrhagic* form there is intense adynamia and nervous prostration from the first, with delirium, great restlessness, somnolence, or a tendency to coma. The face is sunken and anxious, and the breathing hurried. The eruption is slow and irregular in development, sometimes receding; it tends to be livid or black, and if pustules are formed they contain blood. Petechiæ are observed also between the pocks, and hæmorrhage takes place from various parts.

6. *Benigna—Verrucosa—Cornea—Horn-pock or Wart-pock.*—This is a mild and abortive form, in which the pocks do not become purulent, but shrivel and dry up on the fifth or sixth day. There is no secondary fever, and the duration is shorter than usual. It generally follows vaccination. Another mild variety is that in which the eruption continues vesicular to the end—*crystalline-pock*.

7. *Variola sine eruptione.*—It is believed that in persons well protected there may be primary fever without the subsequent appearance of any eruption.

8. *Anomalæ.*—This term is applied to variola occurring along with other exanthemata, during pregnancy, in the fœtus, etc., and thus presenting irregularities.

There are two modifications of small-pox which call for special notice.

Inoculated Small-pox.—When the poison of variola is directly introduced by inoculation the course of events is usually as follows: On the second day a slight discoloration is observed at the seat of inoculation, and on the fourth or fifth day this is somewhat inflamed and irritable, a small vesicle forming, which enlarges and becomes surrounded by an inflamed areola about the seventh day. From this time to the ninth day the ordinary primary fever sets in, and in three or four days more the general eruption appears, the original vesicle having in the meantime become pustular and being now at its height, after which it undergoes retrograde changes. The important fact in connection with the inoculated disease is that in its entire course it tends to be exceedingly mild, the number of pustules being very limited. Occasionally, however, when thus originated it assumes a serious or even fatal form.

Small-pox after Vaccination—Varioloid—Varicelloid.—There can be no question as to the fact of variola being prevented or greatly modified by efficient vaccination. The principal effects of vaccination may be thus stated: 1. It sometimes prevents any eruption, there being merely a slight primary fever for three or four days. 2. It diminishes the number of pocks. In some instances there is marked fever which

ushers in a slight eruption, it may be but a single pock. 3. It modifies and shortens the course of the eruption, and thus diminishes considerably the secondary fever and its accompanying dangers, as well as the destructive effects on the skin with consequent disfigurement. In some instances the eruption, even if extensive, does not go beyond the papular or vesicular stage; in others, though it becomes pustular its course is more rapid, the pustules drying up on the sixth or seventh day. Generally they are small and do not present umbilication. The unpleasant odor is usually absent. In some cases the eruption is preceded by an erythematous or roseolar rash, and it may appear first on the trunk. As the result of desiccation flat, thin crusts are formed; or hard shining scales; or occasionally little tubercles. There is either no pitting at all or this is very slight.

COMPLICATIONS AND SEQUELÆ.—These are very frequent, especially in connection with the more severe forms of small-pox, the more important being, 1. Affections of the respiratory organs, viz., low forms of pneumonia; pleurisy, rapid in its progress and very dangerous; bronchitis, or inflammation of the general respiratory tract, with the formation of much thick purulent material; occasionally œdema glottidis. 2. Affections of the alimentary canal, such as severe glossitis, gastritis, enteritis, profuse diarrhœa. 3. Various local inflammations and abscesses, viz., over parts that are pressed upon; in the subcutaneous cellular tissue; or in the deep structures of the limbs; along with which may be included boils, which often come out in large numbers, and carbuncles. The pus is generally very unhealthy, and sanious. 4. Gangrene of certain parts, such as the scrotum or labia. 5. Erysipelas, especially of the head and face; ecthyma, rupia, or eczema. 6. Pyæmia or septicæmia, from absorption of septic materials. 7. Affections of the organs of sense, which are not uncommonly very destructive, especially ophthalmia; ulceration of the cornea; otitis with purulent discharge, ending in caries of the bones; and destructive inflammation of the nose. 8. Urinary complications, viz., cystitis; retention and subsequent incontinence of urine; renal congestion with albuminuria and casts; or abscess of the kidney. 9. Inflammation of the ovaries or testicles. 10. Various hæmorrhages, especially hæmaturia, menorrhagia, hæmoptysis, and epistaxis, accompanied with petchiæ. 11. Peritonitis in exceptional cases.

PROGNOSIS.—Small-pox is a very grave disease, the proportion of deaths being exceedingly high, averaging about one in three. Death may take place at any period of its course, but occurs most frequently between the eighth and thirteenth days, especially on the eleventh. The usual causes of death are high fever; adynamia; apnœa; pyæmia or septicæmia; direct loss of blood; or, at a later period, asthenia.

The chief circumstances which influence the prognosis are: 1. Age. Small-pox is very fatal in children under five years of age, and in per-

sons who have passed middle life. From ten to fifteen is the most favorable period. 2. The hygienic conditions surrounding the patient, the prognosis being worse if these are unfavorable. 3. The previous habits and health of the patient, intemperance, debility from any cause, or any organic disease being injurious. 4. Whether satisfactory vaccination has been accomplished or not. 5. The nature and intensity of the symptoms. Among the signs of evil import are recognized a very high temperature; persistent and excessive lumbar pain; severe vomiting after the appearance of the eruption; as well as all symptoms of an adynamic or malignant character, with nervous depression. 6. The amount and characters of the eruption. The gravity of a case is in proportion to the confluence of the eruption, and to the rapidity of its extension. The corymbose variety is very fatal. Other dangerous signs in connection with the eruption are—imperfect development of the pustules or their sudden subsidence; lividity, hæmorrhage, or gangrene in connection with them; the presence of petechiæ; pallor with absence of swelling between the pustules. 7. The complications present. These materially influence the prognosis, especially those referable to the respiratory and nervous systems. Hæmorrhages are also of very serious import. Convalescence is often much delayed by complications and sequelæ. Pregnancy is a peculiarly dangerous condition if associated with small-pox. Abortion usually results, and the termination of the case is generally fatal. In some instances the eruption is observed over the fœtus. 8. Epidemic constitution. Some epidemics are comparatively mild, others very grave.

TREATMENT.—The indications for the treatment of small-pox may be stated as follows: 1. To pay strict attention to all hygienic conditions, and to diet. 2. To prevent a copious eruption and endeavor to make this pass through its different stages as mildly as possible, checking extensive suppuration and destruction of the skin, especially about the face. 3. To subdue excessive pyrexia. 4. To sustain the strength of the patient during the process of suppuration. 5. To treat symptoms, which are often distressing. 6. To guard as much as possible against all complications, and treat them as they arise.

1. Even in the mildest cases patients suffering from small-pox should be strictly confined to their rooms. Free ventilation is essential, and the apartment should be large and moderately cool, all carpets and curtains being removed, as well as excessive bedclothes, due care being taken to protect the patient against unnecessary draughts. Cleanliness is also most important, the linen being frequently changed and at once subjected to the action of some disinfecting agent. In the early period a low diet is called for as a rule, with plenty of cooling drinks or ice, as well as fruits, especially roasted apples, while stimulants must be avoided. Later on it is generally necessary to alter the diet gradually, and to have recourse to beef tea, soups, jellies, etc., as well as to stimu-

lants, the nature and quantity of these being regulated by the circumstances of each individual case. In all cases of a low type, and especially when there is much suppuration, considerable support is needed in the way of nutritious food and stimulants, and if there are indications that the patient will have to struggle through a long process of suppuration, it is important not to allow the strength to be much reduced, but to employ supporting measures carefully from the first.

2. The management of the eruption has always naturally attracted considerable attention. At one time it was the custom to keep patients suffering from small-pox very warm and to give them hot drinks, with the view of "bringing out the eruption," but at the present day the object aimed at is to limit this as much as possible, and to modify its course, so as to prevent the dangers of excessive suppuration and the subsequent pitting and disfigurement. The skin must be sponged freely with lukewarm water, to which may be added some antiseptic, such as carbolic acid, Condy's fluid, chlorine water, or sulphurous acid. It has been recommended to apply carbolic acid and oil freely over the surface, but this proceeding is of questionable propriety. Some consider that the eruption is best checked by keeping the patient in a dark room; others advocate puncturing each pock as soon as pus forms. Many *local applications* have been made use of in order to prevent pitting, the chief of which are nitrate of silver, either applied in the solid form to each pustule or brushed over the surface as a solution; mercurial plaster or ointment; solution of corrosive sublimate (gr. ij ad ℥vj); sulphur ointment; tincture of iodine; gutta-percha dissolved in chloroform; and carbolic acid. Most of these are very irritating and require much care in their employment. Dr. Sansom advocates touching each pustule with carbolic acid, and then applying a mixture of this substance with oil of thyme. All the pustules should not be touched at one time, but they should be attacked on successive occasions. Mr. Marson recommends waiting until the pustules have discharged their contents, and then applying either olive oil, alone or mixed with lime-water or calamine; a mixture of glycerin and rose-water; or cold cream and oxide of zinc. He warns against allowing the scabs to dry and to remain for some time on the nose and other parts of the face. Of course the patient must be prevented as much as possible from scratching. The irritation excited by the acrid secretions is best relieved by frequent sponging and by the free use of some absorbent powder, such as flour, starch, hair-powder, or calamine. If there is much eruption on the scalp it is necessary at an early period to cut the hair very short, or even to shave the head.

3. In most cases pyrexia is kept within limits by sponging the skin, and by the administration of cooling drinks, with a diaphoretic saline mixture. A brisk purgative is advisable at the outset, and the bowels should be kept freely open afterwards. If there is a tendency to hyper-

pyrexia large doses of quinine seem to answer best in this disease. Venesection is never called for.

4. During the suppurative stage tonics are needed, such as quinine, iron, or mineral acids with decoction of bark. If there are adynamic symptoms these remedies must be given freely, along with ammonia, camphor, etc., and plenty of nourishing food and stimulants.

5. The chief symptoms which may require to be treated are vomiting or diarrhoea; restlessness, sleeplessness, or delirium; soreness of the throat; and hæmorrhages. It is recommended to give morphia for one or two nights, in order to get the patient into the habit of sleeping. Caution must be exercised in the administration of narcotics if there is much bronchial catarrh or salivation. Delirium in small-pox is frequently an indication for the free use of stimulants. Physical restraint may be required, and benefit is sometimes derived from the use of the warm bath. Sore throat is best relieved by the use of some mild gargle, or by sucking ice frequently, or taking a little currant jelly. Hæmorrhages call for the administration of full doses of tincture of steel, tannic or gallic acid, turpentine, or ergot of rye, separately or some of them in combination. Retention or suppression of urine is said to occur sometimes, but in the Small-pox Hospital it has never been found to give any trouble. The catheter must be employed should the urine be retained.

6. The complications which it is specially necessary to guard against and to be on the lookout for, are those connected with the respiratory organs and eyes, and various abscesses. Inflammations usually call for a stimulating plan of treatment, and rarely is any removal of blood required; occasionally it may be advisable to apply a few leeches. If there is bronchitis, the patient must be encouraged to cough frequently. All abscesses should be speedily opened. Should there be any purulent discharge particular attention is required as regards cleanliness.

In order to prevent complications connected with the eyes, it is recommended to apply cold water constantly, or to use compresses of a weak solution of corrosive sublimate (gr. j ad 3vj). Should either of these arise a supporting treatment is indicated. A blister over the temple often does good if there is much conjunctivitis. Marson recommends the use of poppy-fomentations with alum. It may be necessary to touch an ulcer of the cornea with a pointed stick or solution of nitrate of silver. A green shade should be worn.

Special methods for the treatment of small-pox have been brought forward, but the only one that deserves notice is the treatment by *antiseptics*. On the whole the balance of opinion seems to be in favor of the internal administration of these remedies, but some have not found them so valuable as others, and there is decidedly no unanimity of opinion as to which antiseptic it is best to employ. Different observers advocate the administration of carbolic acid, sulpho-carbolates,

sulphurous acid, sulphites, or hypochlorites. At the same time tonics, such as quinine or iron, may be given.

During convalescence good diet and tonics are required, and cod-liver oil is often very useful. As soon as the patient is in a fit condition warm baths should be employed, carbolic soap being freely used.

Preventive Treatment.—The rules for preventing the spread of contagious diseases should be rigidly carried out in the case of small-pox. Patients who have suffered from this disease must not be allowed to mingle with healthy persons until they are quite convalescent and have been well disinfected. Rooms which have been occupied by such patients, as well as clothing worn by them, must also be thoroughly cleansed and disinfected. Any articles used for cleansing the skin, such as pieces of sponge or rags, should be immediately destroyed. The great prophylactic against small-pox, however, is *satisfactory vaccination* and *revaccination*, as will be pointed out in the next chapter. Inoculation with variolous virus has been practiced with the view of producing a mild type of the disease, but this is only justifiable under certain rare circumstances, viz., when small-pox breaks out among a lot of people in a confined space and no vaccine matter can be obtained, *e. g.*, on board ship out at sea.

CHAPTER XII.

VACCINIA—COW-POX.

ETIOLOGY.—Vaccinia is an acute specific disease, originating from a *specific virus*. In the cow, especially the milch cow, it occurs as a natural malady, either sporadic or epizootic, running a definite course, and attended with the formation of a vesicular eruption near the udder and on the body of the teats. In the human being it is only induced by direct inoculation, either of the matter taken from the cow, or of that conveyed from one individual to another. Many believe that vaccinia is identical in its nature with variola, only modified by its occurrence in another animal, and there have been many observations and experiments which seem to support this notion.

METHODS OF VACCINATION AND PRECAUTIONS TO BE OBSERVED.—The great majority of practitioners vaccinate with lymph taken from the human being, but some advocate that it should be obtained immediately from the cow. There seems to be positive proof that the lymph does not deteriorate or lose its protective power after passing through any number of individuals. The matter should, if possible, be inocu-

lated when fresh, being inserted directly from arm to arm. Often, however, this is not practicable, and the lymph has to be collected in glass tubes, on ivory points, or on little plates of glass, and used subsequently. It has been recommended to mix the lymph in a watch glass with twice its quantity of pure glycerin and water, and preserve this mixture in capillary tubes, which is said to be equally effective. The matter should always be taken from a perfectly healthy child; from thoroughly characteristic vesicles; on the eighth day. Several punctures are to be made on the summit of each vesicle, so that no blood may be mixed with the lymph, and all pressure must be avoided, only such fluid as escapes spontaneously being made use of. If dried lymph is employed for vaccinating, it has to be rendered liquid by mixing it with a very minute quantity of water.

Vaccination ought to be performed when children are very young, *i. e.*, from six weeks to three months old, provided other circumstances are favorable. It is most important that they should be in good health at the time, especially that they are free from skin affections and acute disorders, such as diarrhoea. If small-pox is in the neighborhood, however, vaccination should be performed under any circumstances and at the earliest age, even immediately after birth should there be great risk. If children are weakly and there is no urgency, vaccination may be delayed for a year or two. Of course no age is too late for vaccinating, if this has not been satisfactorily done previously. When vaccination is unsuccessful it should be repeated after a short interval.

The part selected for inoculation is the outside of the arm over the insertion of the deltoid muscle, the skin being made tense. The chief methods of performing the operation, which should be always carried out thoroughly and carefully, are as follows: 1. By a single or double puncture with a sharp lancet well charged with the lymph, this being introduced obliquely under the cuticle into the cutis, so as to make a valvular aperture; the instrument should be left in for a few seconds, and as it is removed the seat of puncture must be compressed. Several special instruments have been invented for this operation. 2. By making a number of minute superficial punctures, or "tattooing" as it is termed, and then applying the lymph with the flat surface of the lancet. 3. By first rubbing in the lymph, then tearing up the cuticle with the lancet over a surface equal to about the area of a sixpenny piece, and finally rubbing in more lymph. Two such patches are sufficient. 4. By scratching the cuticle and thus producing superficial scarification, the lymph being then applied. Some employ single long scratches, distant half an inch to an inch from each other; the best plan, however, is to make a number of fine parallel scratches over a small area, and others may be made across these. Scarifiers have been invented for this purpose, but the ordinary lancet answers very well. 5. By abrasion of the cuticle with the edge of the lancet, used as an eraser is

used to remove blots from paper. 6. By vesication, liquor ammoniæ being applied, and then the cuticle rubbed off and the vaccine matter applied.

When the surface over which vaccination is performed is small, as in the case of puncture or limited scarification, it is necessary to inoculate in at least five points in the same arm at distances of about half an inch apart, or in three places on each arm.

Revived lymph may either be inserted directly by means of the lancet; or, if it is on ivory points, these may be introduced into punctures or rubbed on scarified surfaces.

PHENOMENA FOLLOWING VACCINATION.—At the end of the second or beginning of the third day little papular elevations are visible over the points of inoculation, with slight redness around. The elevation and redness increase, and by the fifth or sixth day distinct vesicles form. These are round or oval, bluish-white, raised at the margin, and depressed in the centre. At the close of the seventh or beginning of the eighth day a circular inflamed areola forms around each vesicle. The latter continues to enlarge during the eighth day, when it is in its most perfect state, being full, tense, rounded and much raised at the margin, and presenting a pearly color and lustre with translucency. The contents appear clear and slightly viscid, but minute active particles are visible under high powers of the microscope, which are supposed by Dr. Beale to be particles of bioplasm to which the lymph owes its active properties.

The areola continues to extend for a couple of days, reaching a diameter of one to three inches, and being accompanied with more or less induration and swelling; sometimes small vesicles form upon it. On the tenth or eleventh day it begins to fade, and at the same time the contents of the vesicle become opaque, while it dries up and becomes brown in the centre, by the fourteenth or fifteenth day a hard reddish-brown scab being formed. This darkens in color, shrivels, and falls off from the twenty-first to the twenty-fifth day, leaving a permanent scar. A typical cicatrix ought to be circular, white, not less than one-third of an inch in diameter, depressed, with minute pits or foveolæ over its base. Sometimes there are radiations from the centre.

The appearances and course above described may be modified by certain obvious circumstances, or without any evident cause. After some of the methods of vaccination the vesicles are compound or in crops. In adults they do not usually present thoroughly typical characters, on account of the structure of the skin, while their course is often retarded and the areola is more diffused. Retardation or acceleration of the course is sometimes observed, without any obvious cause. In some cases an entirely irregular and spurious form of eruption is met with. This is generally due either to improper lymph having been

used; to the child being in an unhealthy condition; or to mechanical irritation: but occasionally it cannot be thus explained.

Many irregularities are observed when the lymph is taken immediately from the cow. "Papulation is deferred till the seventh, eighth, ninth, or tenth day, and the areola is not complete till from the eleventh to the fourteenth or sixteenth day, being also harder, and it is said to revive and decline, continuing to exhibit a brick-red or purplish hue while the hardness remains. The vesicles are usually not more developed than those produced by ordinary lymph. Desiccation is prolonged, and the crust is often retained till the fourth or fifth week."

Certain local and constitutional symptoms usually accompany the development of the vaccine vesicles. There is itching, heat, tension, and pain in the arm at the time of maturation, with a feeling of stiffness and difficulty in movement. Occasionally erythema or erysipelas breaks out, or the vesicles may ulcerate or slough. The glands in the axilla are often enlarged and tender, especially in adults. There is no primary fever, but a symptomatic fever is set up during the process of maturation, and it is said the temperature may reach 104°. At this time the child is fretful and restless, and the alimentary canal is often deranged. In rare instances severe symptoms are met with, which may prove dangerous, especially in weakly children. A general rash is sometimes observed, of a roseolar, lichenous, or vesicular character, which does not usually last beyond a week. These eruptions are more common after vaccination direct from the cow.

REVACCINATION.—This is often required in consequence of the primary vaccination having been insufficient or imperfect, as indicated by deficient number or non-typical characters of the cicatrices. But even when the original vaccination has been in every way satisfactory, it is desirable to revaccinate after puberty. Some recommend that the operation should be performed every seven years, but this appears quite unnecessary, and one efficient revaccination may be considered as affording perfect protection. The same precautions and care are required as in the case of primary vaccination.

Results of Revaccination.—In some cases there is no effect, especially in children. On the other hand now and then a perfectly typical course is observed, chiefly in adults. Usually the course and characters of the eruption are much modified. It appears earlier; reaches its height by the fifth or sixth day; being either papular, or in the form of an acuminate vesicle, with an indurated, diffused, and irregular areola. A small scab forms by the eighth day, which soon falls off. There is generally much local irritation, and constitutional symptoms are usually much more marked than in primary vaccination. Erysipelas is liable to occur, and occasionally fatal pyæmia sets in. I have known a patient to sink rapidly after revaccination, without any obvious cause.

REMOTE EFFECTS OF VACCINATION.—There cannot be the slightest doubt in the mind of any unprejudiced observer with regard to the powerfully protective influence of vaccination against the ravages of small-pox. In a large proportion of cases, if vaccination has been thoroughly and efficiently performed, and especially after revaccination, there is absolute and complete protection against this malady. But even when it is not entirely prevented, the disease manifests itself only in a slight and modified form, is scarcely attended with any danger, and does not leave behind the hideous disfigurement which it produces if allowed to proceed unchecked. Epidemics have been much less frequent and severe since the introduction of the practice of vaccination, and this result has been in direct proportion to the efficiency of the measures which have been put in force to insure general and successful vaccination. This has been observed in every part of the world and among all races. It is very important to bear in mind that in proportion to the number and typical characters of the vaccination-marks will this immunity from small-pox be more certain.

It has been stated that certain affections are transmitted by vaccination, especially cutaneous diseases, scrofula, and syphilis. There is no reliable evidence that this happens to any extent, but cases have been brought forward by Mr. Hutchinson and others which indicate that such a result does occasionally occur, and in order to guard against the mere possibility of this evil, it is necessary to pay strict attention to the precautions already alluded to and especially to see that the vaccine lymph is taken from a perfectly healthy child.

TREATMENT.—All that is generally required is to protect the arm from irritation and prevent the vesicles from being scratched. If there is much subsequent inflammation, wet lint, lead lotion, or poultices may be applied.

During the fever it is well to keep the child indoors and to give some mild aperient. Unusual complications, such as erysipelas, may call for special treatment.

CHAPTER XIII.

VARICELLA—CHICKEN-POX.

ETIOLOGY.—Varicella has been supposed to be merely a modified form of variola, but the evidence is conclusive that they are perfectly distinct diseases. It is decidedly an infectious complaint, and may be transmitted either with or without direct contact. It is doubtful whether it can be inoculated, but probably not. Occasionally this affection assumes an epidemic form. A second attack is never met with.

Varicella is only observed in children, as a rule, but now and then affects adult females.

SYMPTOMS.—I. *Incubation Stage.*—The ordinary duration of the *period of incubation* is twelve days, but it may range from ten to sixteen days. There are no symptoms.

II. *Actual Attack.* 1. *Premonitory or Invasion Stage.*—Frequently this stage is absent; the first symptoms being simultaneous with the appearance of the eruption. In other cases this is preceded for twenty-four to thirty-six hours by slight pyrexia, with headache and sometimes cough.

2. *Eruptive Stage.*—The eruption is rarely delayed beyond twenty-four to thirty-six hours at the most, there being at first but a few spots, but fresh crops appear during four or five nights, often in considerable numbers, and they may continue to come out for ten or twelve days. They are quite distinct, as a rule, but occasionally a few are confluent. They are first seen usually on the body, especially about and between the shoulders and over the chest. Afterwards they extend to the limbs, while the scalp is often much affected, but the face is generally only slightly involved, though the eruption is sometimes abundant here. Some authors have described the eruption as being vesicular from the first. In most cases, however, it begins as bright-red spots, slightly papular, not at all hard, and disappearing on pressure. Within a few hours these become vesicular, a clear fluid collecting under the epidermis. The vesicles are of good size, round or oval, ill-defined, not umbilicated or divided into spaces, so that when punctured they collapse completely. There is no inflammatory areola. The appearance is described as being in some instances "as if the patient had been subjected to a shower of scalding water." In about twenty-four hours the contents of the vesicles become slightly and uniformly opalescent, and a faint red areola appears. Each vesicle either ruptures or dries up from the third to the fifth day, a small scab rapidly extending from the centre to the margin. This is generally thin and crumbly, coming away in particles, but occasionally a thick coherent crust is formed. It separates in about four or five days usually. As the skin is not deeply involved or destroyed, only a slight redness is left, which soon disappears, and there is no pitting, as a rule; in exceptional instances, however, distinct pits are left, which are round or elliptical, smooth, and shining. Owing to the development of successive crops, vesicles are seen side by side in different stages of their progress. The only subjective sensation which attends the eruption is that of itchiness, which may be considerable. A faint, peculiar odor is said to be given off.

The general symptoms are very slight in most cases, there being only a little feverishness. Sometimes there are rather severe exacerbations of fever during the night. Catarrh is frequently present, and

may be dangerous. In some cases the patient remains in an unsatisfactory state of health for some time after an attack of varicella.

A number of *varieties* of varicella have been described, but they are of no importance, and most of them are really modifications of small-pox.

PROGNOSIS.—Death never occurs as the result of varicella, and therefore the prognosis is highly satisfactory.

TREATMENT.—Nothing is required but to keep the patient quiet, give mild diet, and see that the bowels are freely opened. Children must be prevented from scratching themselves. Catarrh must be attended to if present, and should there be much fever a saline mixture is useful. Quinine may be administered during convalescence.

CHAPTER XIV.

ERYSIPELAS—THE ROSE—ST. ANTHONY'S FIRE.

ETIOLOGY.—Only that form of erysipelas which occurs as an *acute idiopathic* disease is considered in this work, the *traumatic* varieties being described in surgical treatises. Undoubtedly this is an *acute specific disease*, and though its contagious nature is denied by some authorities, there is ample evidence to prove that it is an infectious complaint, and that it is capable of being transmitted from one individual to another, especially when several persons are collected together, as in hospitals. I have met with several instances corroborative of this statement. Sometimes also the affection assumes an epidemic form. The poison is given off into the atmosphere, and may likewise be conveyed by fomites, as well as by direct contact or inoculation. There is reason to believe, further, that erysipelas may by infection originate a group of certain allied diseases, such as puerperal fever or hospital gangrene, and *vice versa*. This is one of the affections in the propagation of which bacteria have been supposed to be concerned.

Though capable of being conveyed by infection, on the other hand many cases of erysipelas are met with in which the origin of the attack cannot be thus explained. Indeed, not unfrequently no obvious *exciting cause* can be discovered, while in some instances it is attributed to local exposure to undue cold or heat; general exposure to cold and wet; very slight injury; irritation of bad teeth; errors in diet, especially the use of shell fish and such articles; and violent mental emotion.

Among the more important *predisposing causes* of erysipelas are: 1. Age, the disease being most common in newly born infants and in persons from twenty to forty years old. 2. The female sex, especially during menstruation. 3. Individual and family predisposition. 4. The

occurrence of previous attacks, erysipelas differing from most other acute specific fevers in this respect. 5. Certain conditions of the system, viz., plethora; the condition induced by intemperance or debilitating diseases, as well as that associated with gout or renal disease; or any low febrile state. 6. Certain local conditions, such as various forms of injury, or the presence of dropsy in a part. 7. A warm season.

ANATOMICAL CHARACTERS.—Erysipelas is characterized by a diffuse inflammation of the skin, the subcutaneous cellular tissue being also generally involved, and sometimes the deeper structures. At first there is hyperæmic redness, varying in tint, followed by vesication of the skin and by serous infiltration of the areolar tissue, which causes more or less swelling. In severe cases pus may form under the cuticle, in the subcutaneous tissue, or in the deep tissues. There is no tendency to the formation of lymph, so that the inflammatory process is not limited by adhesions, and any pus formed is liable to be of a low type. Occasionally it terminates in ulceration or gangrene, especially when the tissues affected are in a low state of vitality, as when they are the seat of dropsy. The neighboring lymphatic glands and vessels are always affected, while the veins leading from the erysipelatous part are also inflamed in many cases, and may contain pus. Bacteria have been described as being present in abundance in the tissues towards which erysipelatous inflammation is advancing.

In fatal cases the blood is often dark and liquid, and does not coagulate firmly. The various organs are congested, especially the lungs, or they are sometimes inflamed. The small vessels of the lungs and head frequently contain pus. Little emboli, composed of white corpuscles or albuminoid masses, have been found in the small vessels of the gray matter of the brain by Bastian and others.

The mucous and serous tissues may be the seat of erysipelatous inflammation, as well as the cutaneous structures.

SYMPTOMS.—After an incubation period which is said to range generally between ten and fourteen days, but which may extend to three weeks, an attack of erysipelas is in most cases, but not invariably, ushered in by premonitory symptoms of a general character. There is a feeling of illness, with general uneasiness or muscular pains, disturbance of the digestive organs, sore throat, headache, restlessness, and other signs of nervous disorder, with a certain degree of pyrexia. Some shivering or chilliness may be felt at the outset, but usually no marked rigors are experienced until the local inflammation is about being or has been developed. These symptoms may last from a few hours to four or five days before the characteristic signs of erysipelas appear, but generally the latter are evident within two or three days. Epistaxis occasionally occurs at the outset.

The local signs of erysipelas are as follows: At first there is a feeling of heat, irritation, and tightness; the skin is tender to the touch, and

has a stinging or smarting sensation. Soon the part affected becomes red, swollen, firm, tense, and shining, at the same time all the painful sensations being aggravated, and there being increased thermometric heat. Sometimes the swelling precedes the redness.

The inflammation starts from one spot and generally extends chiefly in some particular direction, but sometimes spreads in all directions equally. There is a well-marked boundary-line between the advancing inflammation and the healthy skin, as shown by the difference in color and by the abrupt termination of the swelling, but only a gradual transition is observed at that border where the process is subsiding.

The hue of the redness varies, but it tends to become darker as the case advances. The swelling is much greater where abundant loose cellular tissue exists, and is then often irregular in form and unequal in consistence, while it pits on pressure. In structures which are tense, unyielding, and closely attached, such as those of the scalp, the sensations are far more painful than in lax tissues.

In slight cases the inflammation subsides, being followed by desquamation of the cuticle; far more commonly, however, vesicles of various sizes form on the surface of the skin, which contain a yellowish serum, and in serious cases large irregular bullæ or bladders are raised. These burst and discharge their contents, often leaving crusts which on separating may disclose superficial ulceration. The cuticle always peels off extensively. Occasionally signs of more or less suppuration, ulceration, or moist gangrene are observed, and these processes may lead to great destruction of tissue.

The seat and extent of the inflammation vary in different cases. Idiopathic erysipelas is most common about the head and face, and it generally begins about the nose, ear, angle of the mouth, lower eyelid, or cheek. Dr. Reynolds has observed that it usually starts at the point where the skin is undergoing transition into a mucous membrane. It tends to spread rapidly, so that the whole face, scalp, and neck may be speedily affected, and there is very great swelling, the features being obliterated, the eyelids closed, the nostrils blocked up, while deafness is often complained of. Not unfrequently abscesses form, especially in the cheeks or eyelids. The erysipelas is prone to extend to the mouth and fauces, and may even reach the larynx. There is also danger of meningitis.

In some instances the limbs are affected, especially the legs, and now and then the trunk. I have met with two cases of erysipelas involving the whole of both legs, complicating acute rheumatism. Some local irritation may determine the locality of an erysipelatous inflammation.

The time taken by erysipelatous inflammation in running its course varies, but the redness and swelling generally attain their height on the second or third day. Different parts of the surface are seen in

different stages of advancement. After it has apparently stopped the inflammation may again spread, and *relapses* are by no means uncommon. In some cases it is *erratic* or wandering in its progress, and may be *metastatic*.

Usually the absorbent glands and vessels in the neighborhood show signs of irritation, being enlarged, painful, and tender, sometimes very much so, and they may be affected first. Suppuration takes place in exceptional cases.

The general symptoms usually increase with the onset of the local inflammation. Ordinarily they merely indicate more or less pyrexia. The pulse rises to 100 or 120, and is full and strong. The temperature ascends rapidly at the outset, and may attain a height of 104° or 105° on the first evening of the eruption. Usually the maximum is reached on the third day, but it increases so long as the inflammation advances, and may attain to 106° or 108°. As a rule there are distinct evening exacerbations, but the evening temperature may be 2°, 4°, or even 5° lower than that of the morning (Reynolds). Defervescence sets in in favorable cases about the fifth or sixth day of the eruption, and the temperature rapidly falls, becoming normal in from twelve to thirty-six hours. It may, however, remain high for a much longer time, and defervescence is then less critical. These observations apply chiefly to *facial erysipelas*, for great deviations as regards temperature are met with when it attacks other parts. Any relapse or extension of inflammation is indicated by a rise in temperature, which may be noticed before there are any external signs. Complications will also influence the temperature. The urine is febrile. Urea is increased and chlorides are diminished. Albumen is frequently present.

In *facial erysipelas* there is considerable restlessness, with, in many instances, mental wandering or actual delirium, especially at night, quite apart from any cerebral complication. The tongue always tends to become dry and brownish, and in all cases of a low type it assumes distinctly adynamic characters, with sordes on the lips and teeth, the pulse becoming very rapid and feeble, and other typhoid symptoms also setting in. This course of events is likewise apt to occur in very feeble and intemperate persons, and in the aged.

The *complications* to be feared are cerebral or spinal meningitis; bronchitis; intestinal catarrh; and renal congestion or inflammation. As already mentioned, erysipelas may spread to the throat or larynx, or may involve serous membranes.

VARIETIES.—Several varieties of erysipelas are described, founded on the intensity, mode of progress, appearances, and terminations of the local changes. The chief of these are: 1. *Simple* or *cutaneous*. 2. *Erratic* or *migratory*. 3. *Metastatic*. 4. *Miliary*. 5. *Phlyctenous*. The last two are named from the size of the vesicles or blebs. 6. *Œdematous*, where there is much œdema. 7. *Phlegmonous* or *cellulo-cutaneous*.

ous, in which the deep tissues are extensively involved and tend to suppurate. 8. *Gangrenous*. Varieties are also named according to the part affected, *e. g.*, *facial*, *scrotal*, etc.

The *erratic* form usually presents less hyperæmia and swelling than usual, and the pyrexia is not so severe, while considerable and rapid changes in temperature are observed. It tends to run a protracted course, and occurs chiefly in the old, or in those suffering from gout, rheumatism, or kidney disease.

PROGNOSIS.—Erysipelas is always a serious disease, and a cautious prognosis should be given in all cases, but especially when it attacks the scalp or face. The principal circumstances which increase the danger of any individual case are as follows: 1. The patient being very young or advanced in age. 2. A low condition of the system, especially that due to intemperance. 3. The presence of organic disease, particularly renal disease with dropsy. 4. The complaint being epidemic, much depending on the type of the epidemic. 5. Any tendency to typhoid symptoms or signs of blood-poisoning. 6. Severe cerebral symptoms, particularly if they point to meningitis. 7. Extension of the inflammation to the throat or larynx. 8. A dark color of the eruption or the appearance of livid vesicles. 9. Any disposition to involve the deep tissues extensively, or to end in suppuration or gangrene. 10. Sudden disappearance of the eruption, with symptoms of some internal part being attacked.

TREATMENT. *General.*—Unquestionably all lowering measures are to be avoided in the management of erysipelas, and a supporting treatment is that which gives the best results. A nutritious diet is necessary from the first, with cooling drinks, and in most cases stimulants are called for at an early period, not uncommonly considerable quantities being required during the progress of the disease.

The patient should, if possible, be isolated and placed in a comfortable, well-ventilated but not draughty apartment, and every attention must be paid to hygienic measures.

The bowels should be kept well opened by saline aperients. The most reliable medicinal remedy in erysipelas is tincture of steel, in doses of 30 to 40 minims every three or four hours. In adynamic cases quinine or ammonia and bark may be given, along with alcoholic stimulants. It is often necessary to administer opium, chloral, or some other narcotic at night.

Local.—Ordinarily it will be found best to cover the erysipelatous part with cotton-wool, having previously powdered it over with flour or a mixture of starch and oxide of zinc. When the face is affected a kind of mask may be made, with apertures corresponding to the mouth and eyes. Among the numerous local applications recommended by different practitioners, the most important are collodion or a mixture of collodion and castor oil; nitrate of silver, either in the form of the

solid stick or solution; and solution of carbolic acid. In some cases there is great pain, and then warm fomentations containing opium or belladonna are serviceable, the surface being afterwards dried and covered with wool. Nitrate of silver is often used in order to check the progress of erysipelas, the stick being rubbed into the skin a little beyond the advancing margin of the inflammation. This appears to succeed sometimes. Suppuration calls for free incisions, and in the phlegmonous variety scarification is of great value.

Various symptoms may require attention in erysipelas, as well as complications, especially meningitis and extension of the inflammation to the throat or larynx. The treatment of these conditions will be considered in their respective chapters, but it may be mentioned that if there is much œdema about the glottis it may be requisite to scarify the part or even to perform laryngotomy.

In order to prevent the spread of erysipelas, it is imperative upon those who are attending cases, especially medical men and nurses, to exercise every precaution against conveying the disease to others, particularly if they have to come into contact with parturient women, or with persons suffering from wounds or ulcers.

CHAPTER XV.

DIPHTHERIA.

ETIOLOGY.—Unquestionably diphtheria is an independent *acute specific disease*, and is ordinarily produced by a *specific poison*, it being a highly infectious complaint, not unfrequently assuming a severe epidemic form. The contagium is believed by some to be associated only or chiefly with the peculiar deposit which forms on the throat and other parts, and it has been asserted that this material must be brought into contact with a mucous membrane or an abraded cutaneous surface before the complaint can be transmitted; there is strong reason to believe, however, that the contagium is given off in the breath, and is also probably contained in the various excretions. The disease may spread through a house, but there is always more danger of infection in the case of those who are brought into close contact with a patient suffering from it, and who therefore inhale the breath or are liable to have the morbid products coughed out upon them. Infection lasts for an uncertain time after convalescence. The affection is more liable to be propagated if there is much discharge, as from the nose, especially if cleanliness is not attended to. The poison clings tenaciously to

houses and rooms for a considerable period, and may be conveyed by fomites. It is a matter of doubt whether diphtheria can be originated by inoculation with the deposit. The same individual may be attacked more than once.

Some believe there is a sporadic form of this disease, which is not contagious, but is produced by unfavorable hygienic conditions, especially by drainage emanations. Cases have come under my notice which certainly seem to bear out this belief.

The *predisposing causes* of diphtheria are the period of childhood; individual and family susceptibility; bodily fatigue or exhaustion; and nervous excitability. Anti-hygienic conditions do not seem to increase the frequency of the contagious form. Hot and dry climates and seasons appear to favor the development of the poison-germs.

ANATOMICAL CHARACTERS.—A peculiar inflammation of the fauces, attended with the deposit of patches of exudation, constitutes the ordinary local manifestation of diphtheria. At first there is redness, which may begin in any part of the throat, with swelling and increased secretion of viscid mucus. The redness spreads over the entire mucous surface, and then the exudation makes its appearance. The deposit may commence at any spot, such as on one of the tonsils, on the soft palate, or at the back of the fauces, and may start from one or several points, there being at first only small specks, which extend and coalesce so as often to form extensive patches, or even to cover uniformly the entire surface. The patches have a variable thickness, and they become thicker by successive layers being formed underneath. The characters of the lymph vary much. The color is usually gray, white, or slightly yellowish; it may be brownish or blackish. The consistence ranges "from cream to wash-leather." The material resembles in some cases wet parchment, or damp and dirty wash-leather. On removing it, which is effected with more or less difficulty, a raw, bleeding surface is left, or sometimes a distinct ulcer, which is again speedily covered by fresh deposit, the exudation forming in the substance of as well as upon the mucous membrane, thus causing its superficial destruction. The under surface of a patch may present little spots of blood. If the exudation separates of itself, it is either not renewed at all or only in thinner films. There is occasionally considerable ulceration or sloughing of the soft palate, uvula, or tonsils; or abscesses may form.

The deposit may spread from the throat to the mouth, lips, nose, conjunctiva, larynx, trachea, or bronchi, even to their finest ramifications; rarely to the œsophagus, stomach, intestines, and gall-bladder. Occasionally it starts primarily in some of these parts. It has also been observed over the vagina and rectum. Any raw cutaneous surface is liable to be affected.

Microscopically the material consists chiefly of epithelial and granular cells, with molecular granules of fat and protein. Sometimes fibres and

disintegrated tissues are visible. Vegetable growths have been observed, but they are not always present, and similar organisms are met with in other products. Chemically it chiefly resembles fibrin.

The lymphatic glands in the neighborhood are enlarged and inflamed, especially those near the angles of the jaw. Should there be much ulceration or gangrene, there is general swelling of the neck, owing to infiltration of the tissues with serum or lymph.

In fatal cases the various organs are found to be much congested. The spleen and lymphatic glands generally are enlarged. The lungs are in many cases the seat of acute insufflation, collapse, lobar or lobular pneumonia, or sometimes of apoplexy. The kidneys may show signs of parenchymatous inflammation. Fibrinous coagula are frequently observed in the cavities of the heart, extending into the great vessels.

SYMPTOMS.—Diphtheria is essentially a general disease with local lesions. Hence it is usually ushered in by general or constitutional symptoms, followed by local symptoms referable to the throat or to other parts which may become involved. Along with these local symptoms the general disturbance is increased, and may become extremely severe, while the disease is liable to be followed by a peculiar nervous disorder.

The *period of incubation* in diphtheria is usually from two to four days (Squire). It may range from thirty hours to eight days, or perhaps even longer than this. The invasion is generally gradual, there being a feeling of illness and languor, more or less weakness and depression, often with chilliness, anorexia, nausea, diarrhœa, headache, drowsiness, with some pyrexia. At the same time there may be some stiffness of the neck, tenderness about the angles of the jaw, or slight sore throat.

The symptoms of the developed disease vary considerably in character and severity, and it is important to notice that the gravity of the constitutional disorders bears no necessary relation to the throat symptoms. Sir W. Jenner has arranged cases of diphtheria into groups, which, however, are not absolutely distinct but often run into each other.

1. *Mild Form.*—Here there are slight throat symptoms, and on examination signs of more or less inflammation with exudation are seen. The glands about the angles of the jaw are a little swollen and tender. Pyrexia is mild and of short duration, but the temperature may rise considerably. The urine is not albuminous. Occasionally extensive deposit on the throat is observed while the general symptoms are scarcely perceptible. Recovery is rapid and complete, and no sequelæ follow the attack.

2. *Inflammatory Form.*—After premonitory symptoms there is high pyrexia, the patient at the same time feeling very ill and weak. The

pulse soon tends to become feeble. Throat symptoms are prominent, examination revealing signs of much inflammation, followed by the deposit of exudation in from twelve to forty-eight hours, which possesses some consistence and toughness. This may be coughed up in pieces of false membrane of variable size. The disease is liable to spread to the larynx, thus giving rise to dangerous laryngeal symptoms and serious interference with respiration. The glands of the neck are much enlarged. The urine is febrile, but also frequently contains much albumen as well as some granular casts.

3. *Insidious Form*.—Without any particular general disturbance and only slight sore throat, laryngeal symptoms suddenly set in with severity, and may lead to speedy suffocation.

4. *Nasal Form*.—There is at first a sanious discharge from the nose, with low fever. Soon the throat is seen to be red and swollen, and fluid escapes through the posterior nares, while the glands about the angle of the jaw swell considerably. The discharge may be very fetid. Afterwards the deposit may form on the pharynx or larynx, the latter being sometimes unexpectedly attacked; or the symptoms may subside.

5. *Primary Laryngeal Form*.—This is characterized by the exudation starting in the larynx and spreading to the pharynx. Laryngeal symptoms are therefore prominent from the first.

6. *Asthenic Form*.—In this class of cases the general symptoms are of a low type, either from the outset or subsequent to the usual symptoms of diphtheria. The sense of illness and prostration becomes very great; the complexion is dirty-looking and opaque, and the skin generally may assume a dirty-yellowish tint, having also a peculiar feverish pungency, though the temperature is not high. The pulse tends to be very frequent, small, weak, and irregular, and the heart's action is greatly enfeebled. The tongue becomes dry and brown, and sordes form on the lips and teeth. Ultimately the ordinary typhoid symptoms set in, with delirium and other nervous phenomena, and the patient sinks.

The above symptoms may or may not be associated with much deposit over the throat or larynx, but this is of a soft pulpy kind, and hence the local symptoms are often not proportionately severe. They are not uncommon in the nasal variety. It is in these cases that extensive ulceration and sloughing are chiefly met with, the symptoms being chiefly due to toxæmia resulting from absorption of the decomposing matters into the blood. The breath is then very fetid, and there is great swelling about the neck.

COMPLICATIONS AND SEQUELÆ.—Albuminuria is of very frequent occurrence during the course of diphtheria, and the quantity of albumen passed is sometimes extreme. Fibrinous casts may be present at the same time, and also more or less blood. These conditions may

be associated with morbid changes in the kidneys, especially in the epithelium lining the tubes, but the relation of this condition to the general disease is not determined. Occasionally the urine is suppressed. Hæmorrhages from the nose, throat, air-passages, and other parts are not uncommon in bad cases, and there may be purpuric spots on the skin. An erythematous or erysipelatous rash is occasionally observed. Pulmonary complications are not infrequent, especially if the respiratory passages are involved, viz., acute distension of the lungs, the vesicles sometimes giving way; pulmonary collapse; lobar or lobular pneumonia; and pulmonary apoplexy.

Diphtheria is liable to be followed by important *sequelæ*. In some cases the progress towards convalescence is very slow, and a state of marked debility and anæmia remains for some time. The most remarkable series of *sequelæ*, however, are those connected with the nervous system. They may follow the mildest attack, but are more frequent and more marked in severe cases. Generally a period of apparent convalescence intervenes, the duration of which varies from a few days to some weeks, but the symptoms appear in most cases within three weeks.

The precise nature, extent, and intensity of the nervous disorder vary in different cases, but the phenomena observed generally point to paralysis, motor and sensory. In some instances they are localized, especially in connection with the pharynx and palate, so that the voice is altered and swallowing is performed with difficulty, which condition may last for a considerable time. True *diphtheritic paralysis*, however, is characterized by being more or less progressive, attacking different parts in succession, so that ultimately the whole body may be implicated. It starts usually in the throat and palate, the voice becoming snuffling or inarticulate; while deglutition is difficult, and fluids are apt to pass into the nares, solids giving rise to a choking sensation, with violent irregular action of the muscles. At the same time the mucous membrane is more or less deficient in sensibility. The tongue, lips, and cheeks may then become involved. Vision is apt to become suddenly impaired from paralysis of the ciliary muscle, the power of adjusting the eye being lost; at the same time the iris is affected, and there may be squinting. The limbs are then liable to be attacked, there being at first tingling and numbness in the fingers and toes, with impairment of touch, which spreads upwards, power at the same time becoming diminished, so that at last the patient has no control over the voluntary movements, and cannot stand or move. After a time the muscles waste and become flabby. The head sometimes rolls from side to side, owing to paralysis of its supporting muscles. The bladder may be involved, giving rise to retention of urine; or there is constipation, owing to the abdominal muscles being affected. In some cases great danger arises from the respiratory muscles being attacked, so

that breathing cannot be carried on. Serious symptoms may also arise from implication of the heart, its beats becoming very infrequent, being sometimes reduced to 16 per minute, as well as slow and weak, and finally the organ may entirely cease to act.

Abnormal sensations are often complained of in various parts, as well as hyperæsthesia and tenderness. Intense neuralgia sometimes follows diphtheria.

The duration of these symptoms varies much. Usually the termination is favorable, provided the respiratory muscles and heart are not involved.

DURATION AND TERMINATION.—The duration of diphtheria ranges from two to fourteen days, but its complications and sequelæ may prolong it greatly. Relapses also are not very uncommon. Death is a very frequent event, especially in some epidemics. The chief causes of death are: 1. Suffocation, owing to the larynx being implicated, which is most frequent in children, and generally happens within the first week. 2. Gradual asthenia, most common beyond the age of puberty and after the first week. 3. Septicæmia. 4. Uræmia. 5. Secondary nervous disturbance. This is very fatal in children, but death does not take place from this cause after two months. Occasionally patients attacked with diphtheria die within a few hours, apparently killed by the virulence of the poison. Sudden death has happened in several instances, which has been attributed to syncope, or to the formation of a fibrinous coagulum in the heart or in one of the great vessels.

PROGNOSIS.—Always grave, the prognosis of diphtheria is worse in children than adults. The chief signs of danger are: Implication of the larynx, with consequent interference with respiration; great discharge from the nares; epistaxis; repeated vomiting or diarrhœa; a very rapid and feeble pulse, or a very infrequent pulse; symptoms of adynamia, especially if accompanied with delirium; suppression of urine; signs of uræmia; the presence of albumen, blood, or casts in the urine, particularly if these are abundant; a sudden rise in temperature. Even mild cases may prove fatal from asthenia; or the nervous sequelæ may set in and cause death.

TREATMENT.—The management of cases of diphtheria must depend very much on their type and intensity, but even the mildest case needs to be carefully watched in its progress, so as to be prepared for any untoward course of events. It cannot be too strongly enforced that there is no specific remedy for this disease, and that the measures to be adopted must be guided by the circumstances of each individual case. It may be further remarked that lowering measures are not well borne, a more or less supporting treatment being always indicated for diphtheria.

The patient must in all cases remain in bed, the room being kept at

a good uniform temperature, and all hygienic conditions being duly observed, especially as regards cleanliness and proper ventilation.

In a severe case it is important that the air of the room should be maintained at a temperature of 65° to 68°, and kept moist with steam, by allowing a kettle with a long spout to be continually boiling, or by boiling water in an open vessel over a spirit-lamp. Children should have a tent made over their cribs by means of curtains or blankets, and the steam be conducted within this by the aid of an elastic tube fixed on the spout of the kettle. Disinfectants may be employed about the apartment, and every precaution must be taken against the spread of the disease.

It is the practice with some to commence the treatment of all cases, if seen at an early period, by administering an emetic; others give a strong purgative. The advantage of such measures is, however, very questionable.

In attacks of a mild nature it is sufficient to open the bowels; give some saline mixture, with a good quantity of beef tea and milk; and employ soothing local remedies, viz., warm poultices or fomentations over the throat, and some simple gargle.

In cases which are at all severe the *general treatment* demands strict attention. In the first place nutritious diet should be given from the outset, including plenty of milk and beef tea. The patient should also take cool drinks freely, and suck small lumps of ice at frequent intervals. If there are any signs of depression considerable nutriment is called for. Alcoholic stimulants are not required at first in most cases, but they must be given as soon as there is any indication that the powers of the system are failing. They are often needed in large quantities in adynamic cases, and children bear them well. The best stimulant ordinarily is brandy, some of which may be administered beaten up with eggs. Iced champagne is also very valuable. If a patient cannot or will not swallow, it is highly important to administer food and stimulants, as well as medicines, by means of enemata.

As regards medicinal treatment, a mild aperient may be given on each day, so as to keep the bowels open. A saline drink, or still more one containing chlorate of potash, is decidedly useful. The most valuable medicine in most cases of diphtheria is tincture of steel, which should be administered in full doses every two or three hours. It may be beneficially combined with quinine. Dr. Wade recommends iodide of potassium (gr. ij to iv) with chlorate of potash (gr. v to x) every two or three hours. Others employ antiseptic medicines. Should adynamic or typhoid symptoms set in, ammonia and bark, camphor, ether, musk, and such remedies are called for.

Local treatment in connection with the throat is of essential importance when exudation has formed, chiefly with the view of preventing its extension. On no account must the membranous patches be torn

off, though some high authorities, including Trousseau, have advocated this measure. Topical applications are called for, and may be made either by means of gargles, inhalations, the throat-brush, atomized spray, or by blowing in powders through a straw or quill. The latter methods are especially useful in the case of children. It must be acknowledged that there is considerable difficulty in deciding what applications answer best, excellent authorities who have had extensive experience in diphtheria differing much in their opinions on this subject. There is every reason to believe, however, that benefit is derived from the use of certain powerful remedies, which are applied by means of the brush. Those most employed are solution of nitrate of silver; dilute hydrochloric acid; tincture of steel or liquor ferri perchloridi with glycerin in equal parts. Some recommend the repeated application of one or other of these; but it is better to follow the plan advocated by Sir W. Jenner, viz., of making one thorough and efficient application, around as well as over the patches. He advises that a solution of caustic (℥j to 3j of water) should be used, the surface around the exudation being touched with the solid stick; or a mixture of equal parts of hydrochloric acid and water.

Gargles are valuable if the patient is old enough to use them, the most serviceable being one containing tincture of iron and glycerin, or a solution of chlorate of potash. Solution of phosphate of soda has been recommended with the view of dissolving the false membrane. Antiseptic gargles are also often very serviceable, such as one of carbolic acid, Condy's fluid, or hypochlorite of soda, particularly if there is any tendency to gangrene or ulceration, when solid caustic must also be freely applied. The use of sulphurous acid spray, applied by means of the atomizer, has been found very efficacious. The plan of blowing in powders has also been commended, a mixture of alum and sugar, as well as tannin having been employed in this way. When there is discharge from the nose, this should be frequently washed out by means of antiseptic injections through the nostrils; while applications may be made to the posterior nares from the throat.

There has also been much controversy as to the treatment which should be adopted when the larynx is involved. If the difficulty of breathing is only moderate, relief may be afforded by giving an emetic, by means of which some exudation may be got rid of. Paroxysmal dyspnoea may also be relieved by chloroform or ether. Should there be, however, evidence of considerable obstruction to the breathing, the exudation continuing to increase, the only possible thing to be done is to perform *tracheotomy* or *laryngotomy*, the former being applicable for children, the latter for adults. Sir W. Jenner urges that the trachea should be opened as high up as possible, and recommends that the edges of the wound be touched with caustic. The utmost precautions must be taken after the operation to prevent inflammation of the res-

piratory organs. The tubes must also be kept properly cleansed. The results of the operation are almost always temporary relief and prolongation of life; ultimately the issue is very frequently fatal, still cases do recover sometimes when apparently almost hopeless.

Dr. B. W. Richardson has recorded a case (*Medical Times and Gazette*, July 17th, 1875), in which the employment of artificial respiration, by means of the double-acting bellows, was efficacious in saving the life of a patient when *in extremis*, after tracheotomy had been performed.

Symptoms or complications may need attention in diphtheria. It is important to look to the urine, and should there be any signs of suppression, poultices and fomentations should be freely applied over the loins, or dry cupping may be employed.

In order to hasten convalescence, change of air is most useful, especially to the seaside. Good diet is also essential, with tonics, and cod-liver oil. For the nervous sequelæ, the best remedies are quinine and iron, or strychnine, with a supporting and nutritious diet, including stimulants. Blistering the nape of the neck is sometimes beneficial. Galvanism may be employed in connection with paralyzed parts.

CHAPTER XVI.

MUMPS—IDIOPATHIC PAROTITIS.

ETIOLOGY.—Mumps is probably an *acute specific disease*, and there is every reason to believe that it is infectious. Almost always the complaint assumes an epidemic form, but it may be localized in houses or institutions where a number of young persons are aggregated together. It rarely occurs except in young individuals, being very common about puberty, and also from five to seven years of age. Males are much more frequently attacked than females. Epidemics are most prevalent in spring and autumn.

ANATOMICAL CHARACTERS.—Mumps is chiefly characterized anatomically by inflammation of one or both parotid glands. Some pathologists are of opinion that the process begins in the cellular tissue which pervades the gland tissues; others that a catarrh of the gland ducts first occurs. The affected gland is hyperæmic and enlarged, being infiltrated with a serous fluid. Fibrinous exudation is not often observed, and a most important point to notice is, that there is extremely rarely any tendency to the formation of pus. The tissues around are more or less infiltrated. As a rule the swelling rapidly subsides and the gland

returns to its normal condition. Occasionally the submaxillary gland is involved, and the testicles or other parts may be the seat of metastatic inflammation.

SYMPTOMS.—The *period of incubation* for mumps is from fourteen to twenty-two days. In most cases there is some premonitory fever, which lasts from one to three days before local symptoms are manifested, but occasionally they come on simultaneously. The pyrexia usually continues throughout the attack, but may subside on the appearance of the local signs, and it is seldom severe, nor does the patient feel particularly ill. A swelling or fulness appears in the region of either parotid gland, commencing just below the external ear and then extending up to the zygoma as well as to a variable extent over the face and down the neck, thus giving rise to much disfigurement. It has an elastic feel, being firmer over the centre than at the circumference. The skin may be reddened over it, but is frequently unaltered. More or less pain or uneasiness is felt, with a sense of tension, increased by opening the mouth, masticating, or swallowing; there is also tenderness on pressure. Salivation occurs now and then, and occasionally deafness is complained of. In the great majority of cases the swelling subsides about the fifth or sixth day, and has quite disappeared in two or three days more; but in the meantime the gland on the opposite side frequently becomes affected and goes through a similar course, or both may be involved at the same time. A hardness occasionally remains for some time; and in very exceptional instances abscesses form in the gland, which open externally or into the external meatus. The submaxillary gland is sometimes attacked, and the surrounding lymphatic glands, as well as the tonsils, are often enlarged.

An important character of this disease is its liability to *metastasis*, especially in adults. This may be preceded by some dangerous symptoms. The testicle is most frequently attacked, orchitis setting in as the inflammation subsides in the parotid, with effusion into the tunica vaginalis and œdema of the scrotum. Occasionally the parotid and testicle are affected at the same time, or alternately for several times in succession. The orchitis generally runs a favorable course, but it may lead to wasting of the testicle. In females the labia, mammary gland, or ovary may be attacked in the same way. Meningitis has been stated to have occurred in very rare instances.

TREATMENT.—In most cases but little treatment is required. It is necessary to keep the patient indoors in a comfortable room, or even in bed if the case is at all severe. An aperient is useful at the outset, and the bowels should be kept regularly open. Saline medicines may be given, so as to promote the action of the skin and kidneys; and during convalescence quinine is advisable. The diet should consist of liquids, especially milk and beef tea. The only local treatment generally needed is to use hot fomentations, and cover the part with cotton-wool. The

application of a leech or two may possibly be required. If an abscess forms it must be opened, and any hardness that is left may be removed by friction with oil or by painting with tincture of iodine. When metastasis takes place it is recommended to endeavor to excite the return of inflammation in the parotid by means of mustard poultices or blisters. Orchitis must be treated by rest and fomentations.

CHAPTER XVII.

HOOPING-COUGH—PERTUSSIS.

ETIOLOGY.—Hooping-cough is generally regarded as an infectious disease, depending upon a *specific poison*, which may travel a considerable distance through the atmosphere, or be conveyed by fomites. It is chiefly given off in the breath. The disease commonly occurs in an epidemic form, but may be sporadic. It may be communicated by infection before the characteristic “hoop” is developed. A second attack is scarcely ever observed.

The chief *predisposing causes* are childhood, especially after the second year; a cold and damp season or climate; and exposure to all causes of “cold.”

ANATOMICAL CHARACTERS AND PATHOLOGY.—Most authorities regard hooping-cough as a peculiar catarrh of the mucous membrane of the air-passages, attended with hyperæsthesia; others think that it is either entirely or partly due to some morbid condition in connection with the vagus nerve. There may be evidences of catarrh in fatal cases, but frequently these are absent. Those who advocate the nervous origin of the disease have described appearances of inflammation about the vagus nerves; enlarged bronchial glands pressing upon them; or congestion of the medulla oblongata and its membranes. In most cases, however, none of these conditions are observed. The most important morbid conditions associated with hooping cough are those which are of the nature of complications, viz., bronchial catarrh; lobular collapse of the lungs; acute insufflation or emphysema; dilatation of the bronchi; and catarrhal pneumonia. Rarely croup or meningitis may be present.

SYMPTOMS.—The *period of incubation* for hooping-cough is uncertain, but Dr. Squire has found evidence of the disease as early as from two to four days after exposure to infection. The symptoms are divided into certain stages.

First or Catarrhal Stage. At the commencement there are no char-

acteristic signs, there being merely pyrexia, which is often sharp, accompanied with signs of catarrh, viz., running from the nose, sneezing, redness of the eyes, frequent and usually severe paroxysms of cough, at first dry but soon attended with a peculiar expectoration. This stage may last from two days to two or three weeks or more, and in proportion to its duration and severity will usually be the duration and intensity of the entire disease.

Second or Spasmodic Stage. The fully established disease is characterized by peculiar fits of spasmodic cough. A paroxysm generally sets in abruptly without any obvious cause, being in many cases preceded by a sensation of tickling in the throat, or some other unpleasant feeling. The cough is very severe and distressing, consisting of a number of short, quick, spasmodic or convulsive and forcible expiratory puffs, followed by a prolonged, clear, shrill inspiratory sound or "hoop," these alternating for a variable number of times; if the fit is of very long duration, the cough at last becomes almost inaudible. It is usually terminated by the expectoration of a considerable quantity of thick, viscid, clear fluid, which may also be discharged through the nose, and not uncommonly vomiting takes place. Breathing being interfered with, the child presents the appearances due to non-aeration of the blood and venous congestion, and in prolonged attacks may become almost asphyxiated. Usually there is a feeling of much exhaustion with soreness about the muscles of the chest after a paroxysm, but these soon pass away. As accidental occurrences there may be bleeding from the eyes, nose, mouth, ears, or rectum; involuntary discharge of urine and fæces; hernia or prolapsus ani; or convulsions. Physical examination of the chest during a fit reveals that air does not enter the lungs properly. The physical signs of pulmonary complications can often be detected.

The frequency and duration of the paroxysms vary greatly, the one being generally in proportion to the other. As a rule the disease becomes intensified up to a certain point, attaining its height at about the end of the third, fourth, or fifth week, and then subsides gradually.

During the intervals the patient is usually apparently well, but in severe cases there may be prolonged exhaustion, languor and debility, loss of appetite, headache, sleeplessness, pyrexia, and other symptoms; or various complications may give rise to their special clinical phenomena.

Third or Decline Stage. There is no sudden transition to this stage, but a gradual diminution in the frequency and intensity of the fits, while the cough loses its special characters, and expectoration becomes more easy, the sputa being opaque and muco-purulent like those of ordinary bronchial catarrh. At the same time vomiting ceases and the health improves. Finally the cough stops altogether and the patient is convalescent.

COMPLICATIONS AND SEQUELÆ.—Some of these are directly due to the cough, others are accidental. The chief are bronchitis, which may become capillary; lobular collapse; emphysema or insufflation; rupture of air vesicles, with subcutaneous emphysema; catarrhal pneumonia; pleurisy; phthisis; acute tuberculosis; croup; convulsions; cerebral apoplexy; meningitis; hernia; gastritis or enteritis, with obstinate vomiting and diarrhœa; other specific diseases.

DURATION AND TERMINATIONS.—The duration of hooping-cough is very variable, but from six to eight weeks is stated to be the average. The third stage may continue for an indefinite period, and a *relapse* is not uncommon. Most cases terminate in recovery, but death is not an uncommon event, being occasionally due to the severity of the disease, but usually to complications. Some permanent organic mischief is often left behind, or the chest may become deformed.

PROGNOSIS.—Hooping-cough is always a serious disease, and calls for a guarded prognosis. The general circumstances which increase its gravity are, very early age, dentition, constitutional debility, residence in a large town, poverty and its consequences, and epidemic prevalence. The complaint is more dangerous in proportion to the number and severity of the paroxysms, the degree of pyrexia, and the gravity of the complications present.

TREATMENT.—Numerous specific remedies have been brought forward for the treatment of hooping-cough, but they all fail in most cases, the disease running its course unchecked, though it may be mitigated in its severity. The chief indications are: 1. To prevent or subdue the paroxysms of cough, at the same time care being taken that there is no accumulation of secretion in the bronchial tubes. 2. To obviate all complications and treat them as they arise. 3. To attend to the general health and to the state of the secretions.

It should be a constant rule in the case of children to pay immediate attention to any chest symptoms, and this applies to the early period of hooping-cough. The patient should be kept in a warm room, be well clad in flannel, and have warm drinks, in order to promote perspiration. An aperient may be given, and a mixture containing liq. ammon. acet. and vin. ipecac. should be administered.

In the second stage the most important remedies are sedatives and antispasmodics, for the purpose of allaying the paroxysms of cough. These must be given in minute doses, and their effects closely watched. The most efficient are belladonna, in the form of tincture, extract, powdered leaves or root; opium, syrup of poppies, or morphia; hydrocyanic acid; conium; hyoscyamus; tincture of lobelia; cannabis indica; ether; chloroform; valerian; musk. The alkaline carbonates are believed to be useful, and either of them may be combined with one of the above remedies. In my experience I have found most benefit from a mixture of vin. ipecac. and hydrocyanic acid (℞ $\frac{1}{4}$ to ℞ $\frac{1}{2}$); or

from tincture of belladonna. Some advocate inhalation of chloroform or ether.

Of the various specific remedies advocated the chief are alum (which is in some cases decidedly valuable); dilute mineral acids, especially nitric; cochineal; arsenic; nux vomica or strychnine; bromide of potassium or ammonium; infusion of clover; and repeated emetics. The last are useful if there is any tendency to accumulation of secretion in the bronchi. Metallic salts, viz., those of copper, zinc, iron, and silver, have been recommended by various authorities, and may be useful in those cases which tend to become chronic. Inhalations of carbolic acid have been recently advocated.

Local applications have been tried, viz., touching the larynx with a strong solution of nitrate of silver; counter-irritation to the chest or along the vagus nerve; friction with opium, belladonna, and other liniments over the chest; and the application of a belladonna plaster. They are of doubtful benefit.

The general management is important. In bad weather a child suffering from hooping-cough should be confined to the house altogether, or even to one room maintained at a uniform temperature; but in favorable seasons it is decidedly beneficial for the patient to be out in the fresh air during the warmer part of the day. The clothing must be sufficiently warm. It is important to attend to the diet, and to the state of the alimentary canal; should dentition be proceeding the teeth must be looked to. Children who have sufficient intelligence may be taught to suppress unnecessary cough as much as possible.

Complications must be watched for and treated as soon as they arise. Inflammatory affections do not bear lowering measures well in hooping-cough and supporting treatment is needed.

During convalescence tonic remedies, especially iron and quinine, are useful. Change of air is also found to be most beneficial in prolonged cases, or a sea-voyage. Good diet is needed, with a little wine. There is no protection against hooping-cough, except in removal from the source of infection.

CHAPTER XVIII.

INFLUENZA—EPIDEMIC CATARRH.

ETIOLOGY.—Influenza is essentially an epidemic disease, and usually attacks a large number of persons, either simultaneously or in rapid succession. Often it breaks out in several parts of a district at the same time. It generally progresses in a certain direction, and is said

to have a cyclical course; frequently, however, it prevails over a very large area. The inhabitants of large towns are chiefly affected, especially in those parts which are low, damp, overcrowded, and in other unfavorable hygienic conditions. Sometimes the disease breaks out even at sea. It is very prone to influence the characters of other affections.

The exciting cause of influenza is believed to be a *specific poison* which is conveyed only by the atmosphere. The nature of this is doubtful. Most authorities regard the complaint as being infectious; others consider it to be of malarial origin and non-infectious. Inoculation cannot be effected. Various hypotheses have been advanced to explain the occurrence of epidemics, but none of them are satisfactory. They break out at all seasons, but sudden changes of temperature are said to favor their development.

The chief individual *predisposing causes* are the female sex slightly; adult and advanced age; a low condition of the system; exposure to cold; and, it is said, chronic lung and heart diseases. The presence of any acute disease is believed to afford protection. One attack of influenza does not prevent another, and it has even been stated to render the individual more susceptible.

ANATOMICAL CHARACTERS.—The usual morbid appearances in influenza are those of catarrh of the mucous membrane of the nose and its communicating sinuses, conjunctivæ, mouth, throat, and respiratory tract. In severe cases capillary bronchitis, pulmonary congestion and œdema, or pneumonia may supervene, the inflammation often involving both lungs. Sometimes the lining membranes of the entire alimentary canal and genito-urinary apparatus are affected. Occasionally pleurisy or pericarditis supervenes; or very rarely meningitis. There is no splenic enlargement.

SYMPTOMS.—Influenza is a disease running a specific and definite course, characterized by pyrexia with much constitutional disturbance, and local symptoms due to the implication of the mucous membranes. The *period of incubation* generally lasts from a few hours to five or six days, but may extend to two or three weeks.

The general symptoms usually precede the local, but not always. The invasion is often markedly sudden, but in other cases it is gradual. The early symptoms are chilliness, lassitude, pains in the limbs, and in some cases intense headache or nausea and vomiting; followed by fever, which is usually high, the skin being very hot and dry, though sometimes there is much sour perspiration. At the same time the patient complains of a feeling of great prostration and debility, apathy, lowness of spirits and mental inaptitude; with severe aching and shooting pains about the chest, back, limbs, and neck; headache, giddiness, and general restlessness. The pulse is at first frequent, full, and bounding, but soon tends to become soft, weak, and slow. The urine is febrile.

The pyrexia generally presents evening exacerbations, and is said to be in some districts intermittent. In uncomplicated cases its duration usually varies from four to eight days, being frequently terminated by critical perspiration, abundant urine with deposit of lithates, or diarrhœa; but in other cases it subsides gradually.

The local symptoms vary according to the seat and extent of the catarrh of the mucous membranes. Usually this begins in the nose and conjunctivæ and spreads downwards. The nose feels hot and dry at first, and the eyelids smart. Soon a watery acrid discharge flows abundantly, and there is much sneezing, the sense of smell being impaired or lost; occasionally profuse epistaxis occurs. The mouth, tongue, and throat feel sore, and taste is defective. Severe pain is experienced across the forehead, owing to implication of the frontal sinuses. There may be pain along the Eustachian tube, with noises in the ears and some deafness. Examination reveals redness of those membranes which can be seen, and often herpes is visible about the lips. The symptoms indicating implication of the air-passages are hoarseness; soreness and a tickling sensation along the larynx and trachea; more or less dyspnoea; oppression and stuffiness across the chest; paroxysmal cough, at first dry, but afterwards attended with bronchitic expectoration. These catarrhal symptoms usually subside from the fifth to the seventh day, the materials discharged undergoing the ordinary changes observed in the course of a catarrh. The tongue is furred, and there is much thirst with loss of appetite. Gastro-enteric catarrh is evidenced by epigastric pain and tenderness; redness of the tongue; nausea or vomiting; and diarrhœa.

Cases differ much in their severity, and not unfrequently dangerous lung complications arise, especially capillary bronchitis and pneumonia. The latter is apt to come on very insidiously, without any prominent symptoms. In these and other cases there is sometimes a tendency to adynamia, the tongue becoming brown and dry. Nervous symptoms are occasionally prominent, viz., delirium, stupor, and convulsions.

DURATION AND TERMINATIONS.—Uncomplicated cases of influenza generally begin to convalesce from the fifth to the tenth day, but the duration may be much prolonged by complications. The great majority of cases end in recovery, but convalescence is often very tedious, and sequelæ are apt to remain, viz., great debility and nervous depression; neuralgic and rheumatic pains, which are common about the head and neck; or persistent cough. Occasionally chronic bronchitis and emphysema, chronic laryngitis, or phthisis is set up. Death is usually the result of lung complications, but sometimes follows adynamic symptoms.

PROGNOSIS.—The circumstances which make influenza grave are very early or advanced age; a feeble constitution; the presence of chronic pulmonary or cardiac disease; serious lung complications, with great

dyspnœa, inability to expectorate, and signs of imperfect blood aeration; nervous disturbance; evidences of weak circulation; adynamic symptoms. Some epidemics are much more fatal than others.

TREATMENT.—It has been satisfactorily proved that lowering treatment is injurious in influenza. In all cases it is advisable to keep the patient indoors, in a cool, well-ventilated room, but protected from draughts. At the outset a purgative is useful, and in adults a dose of calomel seems to be beneficial, but repeated purgation is decidedly to be deprecated. Some recommend an emetic at the commencement, but such treatment is only indicated if there is much nausea. The diet must depend on the nature of the case; if it is slight, a moderate quantity of beef tea and milk may be allowed; but in severe cases attended with much depression a considerable amount of liquid nourishment is required. It is found that it is better to give things cool, and cold or iced drinks are very grateful and may be freely allowed. Dr. Parkes recommends a highly diluted solution of nitrate of potash with lemon-juice and sugar. Stimulants are not required at first unless there is much debility, except in old persons, who generally need them early; in some instances large quantities of wine or brandy are called for, but they must be used cautiously. Quinine is a remedy which is usually well borne and does much good; it is most valuable towards the decline of the disease, but may be given from the commencement.

The catarrhal symptoms are best relieved by inhalations of steam, to which some add ether, chloroform, or conium. Dr. Parkes suggests that direct local applications to the nasal mucous membrane and throat might be useful. For the bronchial catarrh ipecacuanha wine in full doses answers best, and it may be combined with some sedative, such as henbane or conium, care being taken that there is no accumulation of secretion. Opium should be employed with caution. Poultices, sinapisms, and warm or anodyne fomentations to the chest are often valuable. Should capillary bronchitis or pneumonia supervene, stimulant treatment is decidedly indicated, ammonia with decoction of bark and chloric ether, camphor, and such remedies being administered, as well as alcoholic stimulants. Free dry cupping is often valuable in these cases. The patient must be encouraged to cough should there be extensive bronchitis, in order to get rid of the secretion, and if this accumulates an emetic must be given.

If the pains are severe, iodide of potassium with quinine often gives relief. It may be necessary to administer opium, and perhaps subcutaneous injection of morphia might be attended with benefit. Some recommend colchicum. Pyrexia may be moderated by cold sponging. Cold to the head and the application of two or three leeches might be necessary should dangerous nervous symptoms arise.

During convalescence tonics are needed, especially quinine and iron, with nourishing food and wine or beer. Change of air is highly bene-

ficial, and the patient must wear flannel, and guard against taking cold. Expectorant remedies are often required at this time, and excessive cough must be allayed by opiates.

CHAPTER XIX.

EPIDEMIC, ASIATIC, ALGIDE, OR MALIGNANT CHOLERA— CHOLERA MORBUS.

ETIOLOGY.—Cholera is an *acute specific disease*, which chiefly prevails as a virulent epidemic, but in certain regions is endemic. The *exciting cause* is undoubtedly a *specific poison*, the nature of which is quite unknown, though it has been presumed to consist of certain microscopic living organisms and their germs, which have been described by different observers as being present in the excreta and blood. The careful researches of Drs. Lewis and Cunningham have, however, led them to conclude that cholera is not dependent upon any microscopically demonstrable poison. It is unquestionably an infectious disease, and is capable of being transmitted from one human being to another, but there is abundant proof that the stools constitute the main, if not the only, channel of contagion, and that the great cause of the propagation of cholera is the contamination, in one or other of the ways mentioned in the chapter on contagion, of the water used for drinking purposes with the excreta of persons suffering from the complaint. It has been found that the admixture of an extremely minute quantity of the specific stools will impart to great quantities of water the power of originating the disease if taken into the alimentary canal. Probably the contagium becomes rapidly multiplied in the water, especially if this is exposed to the heat of the sun. Milk is also liable to convey the cholera poison, as in the case of typhoid fever, and possibly other articles of food may be the vehicle for its transmission. There does not seem to be any danger from merely being in the presence of those suffering from cholera, but emanations from the excreta into the atmosphere may generate the disease, being afterwards swallowed or inhaled, especially in places which are ill-ventilated.

The poison of cholera has been regarded by some as having a malarial origin, and they deny that the malady is infectious. Pettenkofer believes that the germs of the disease, after leaving the human body, develop and multiply in the subsoil moisture under the influence of heat, and rise as a miasm into the atmosphere.

The immediate cause of a cholera epidemic is often obscure and dif-

difficult to detect, but a more correct knowledge of the etiology of the disease will probably in future clear up much of the obscurity on this matter. Many authorities maintain that cholera has been imported into Europe and other parts of the world from India, and Macnamara affirms that every outburst of the disease can be traced back through a series of cases to that country, it being propagated by human agency and always following the principal paths of human intercourse.

Certain conditions tend to promote the spread of cholera and aggravate its intensity, viz., a high temperature, with a moist, heavy, and stagnant atmosphere, cholera being therefore more prevalent in certain hot climates and in hot seasons; a low position of a district; unhealthy sanitary conditions, especially overcrowding, want of proper ventilation, accumulation of decomposing organic matter from imperfect drainage or any other cause, and impure and unhealthy food and water. Many other conditions have been supposed to affect the prevalence of cholera, such as the nature of the soil, the electrical state of the air, or the amount of ozone in it; but the statements on these matters are quite contradictory. It is found that most cases of cholera break out early in the morning.

Certain individual *predisposing causes* have been mentioned, but about many of these there is also much contradiction. Among the chief are fatigue, as after marching a long distance; destitution, errors in diet, abuse of purgatives; depressing mental influences, especially grief and fright; rather advanced age, race, intemperate habits, a bad state of health, certain occupations, recent arrival in an infected district. One attack does not afford protection against another.

ANATOMICAL CHARACTERS.—The morbid appearances met with in the majority of cases of death from cholera may be thus summarized: The temperature generally rises after death, and the body remains warm for some time. Rigor mortis sets in very speedily, there being often powerful muscular contractions, displacing and distorting the limbs. The skin is mottled, more or less livid or blue, especially in dependent parts, and the limbs are shrunken, but these appearances are less marked than before death. Some striking peculiarities as regards the distribution of the blood are usually met with. The left cavities of the heart are contracted and rigid, almost or quite empty, as well as the arterial system generally; the right cavities are distended with blood, as are also the pulmonary artery and its divisions and the systemic veins. The capillaries of the lungs, however, and the pulmonary veins contain little or no blood, and these organs are in a state of more or less collapse, in some cases being almost completely airless and bloodless. Occasionally there is some hypostatic congestion. The condition just described is regarded by some observers as highly important in a pathological point of view, but Macnamara affirms that it is frequently due to post-mortem change, the blood being forced by

post-mortem rigidity out of the left ventricle and arteries into the capillary and venous systems; and that if the examination is made immediately after death, the left side of the heart will be found as full of blood as the right. Most of the organs of the body are not congested but shrunken and pale, their capillaries being empty, but the alimentary canal and kidneys are commonly more or less injected. The blood is frequently much altered in its physical and chemical characters, being thick, dark, and tarry-looking, becoming lighter on exposure. Most observers affirm that it is deficient in coagulability. Ecchymoses are sometimes seen under mucous and serous membranes, while the endocardium and serous fluids are often stained with hæmatin.

The stomach and small intestines generally present more or less injection of their mucous lining, that of the intestines being also somewhat thickened and œdematous. The bowels are distended and contain a quantity of materials in the main similar to those discharged during life. They differ, however, in having an abundant admixture of shed epithelium, which is believed therefore to be detached after death. Sometimes there are masses of gelatinous or fibrinous matter, or much grumous blood. The glandular structures are commonly enlarged and prominent, especially Peyer's and the solitary glands, the latter in rare instances presenting ulceration. In exceptional cases a diphtheritic deposit has been observed. The large intestines are usually contracted, but do not exhibit any special characters. The bladder is contracted, sometimes extremely so, and its epithelium, as well as that of the urinary passages and vagina, may be shed profusely.

In cases which survive into the *reaction stage* there are more marked post-mortem appearances, indicating gastric and intestinal inflammation; acute Bright's disease; extreme congestion, low inflammation, or gangrene of the lungs; serous inflammations of a low type; or other complications to be hereafter mentioned; whilst those characteristic of cholera disappear more or less.

SYMPTOMS.—Cholera affords in typical cases a well-defined clinical history, which it is customary to divide into certain stages. The *period of incubation* is of uncertain duration, but it may range, according to different observers, from one to eighteen days. From two to four days is a common incubation-period (Squire).

1. *Premonitory Stage.*—In many instances this stage is not apparent, the disease manifesting itself suddenly in all its virulence. Diarrhœa is the most important premonitory symptom observed, which may or may not be attended with griping. Nervous disturbances have also been noticed sometimes, though many doubt their reality, such as a sense of languor, debility, exhaustion, or marked depression, trembling, altered expression of countenance, unaccountable lowness of spirits, headache, giddiness, noises in the ears, epigastric uneasiness and oppression, etc. This stage is of short duration.

2. *Evacuation Stage.—Stage of Development.*—At this time the prominent symptoms are severe purging and vomiting, the materials discharged having special characters; constant thirst; painful cramps; with signs of marked general disturbance, in the direction of prostration and collapse, with great restlessness. The purging is the first symptom, and it often sets in early in the morning, becoming speedily very frequent or almost constant, being followed by a sense of much exhaustion, and of sinking at the epigastrium. The stools are very profuse, watery, at first colored by the previous intestinal contents, but soon presenting peculiar characters, and being named “rice-water” stools, from their resemblance to water in which rice has been boiled. Then they are perfectly liquid, exceedingly pale, somewhat opalescent or occasionally whitish or milky, with but little odor. On standing more or less sediment falls, resembling flakes of boiled rice, leaving a whey-like fluid above, which has a specific gravity of from 1005 to 1010, and a neutral or slightly alkaline reaction. The quantity of deposit is actually very small, Dr. Parkes having found the amount deposited from a pint not to weigh when dried more than four grains. Chemically the evacuations consist mainly of water holding in solution a considerable proportion of salts of soda and potash, especially chloride of sodium, with but very little albumen or other organic matter. The sediment has been supposed to be modified fibrin or mucus. Microscopically the objects which have been described are abundant granules; active, amœbiform particles of “bioplasm;” nuclei; round, nucleated, and granular cells, resembling pus or exudation cells; peculiar hyaline cells; a few epithelium particles; fungi, bacteria, vibrios; and occasionally triple phosphates. In exceptional cases blood or its coloring matter is discharged. Often the diarrhœa is painless, but there may be griping, and a burning sensation at the pit of the stomach is frequent. Vomiting comes on later, and is less severe and profuse, occurring chiefly after anything is taken. The vomited matters, which are often expelled with much force, are at first the previous stomach-contents, but soon consist of a clear, colorless or yellow, thin fluid, with mucus and disintegrated epithelium. The cramps usually set in at the same time as the rice-water stools, affecting mainly the fingers and toes, calves of the legs, and thighs, but sometimes the abdominal muscles also suffer. Thirst soon becomes a distressing symptom.

In proportion to the severity of the purging and vomiting, a sense of exhaustion is felt, and signs of depression and collapse appear, culminating, if the symptoms do not subside, in those characteristic of the next stage, under which they may be more conveniently described.

3. *Stage of Collapse.—Algide Stage.*—There is no abrupt commencement of this stage, but a more or less rapid transition from the former. The aspect of the patient becomes highly characteristic. The features

are pinched and shrunken, assuming a leaden or livid hue, especially about the lips; the eyeballs sink in their sockets, while the lower eyelids fall and the eyes are half closed; the nose is sharp and pointed, and the cheeks are hollowed. The entire surface is more or less cyanotic, especially that of the extremities, while the skin presents a peculiar wrinkled and shrivelled aspect, being often at the same time bathed in cold sweats, the hands appearing sodden like those of a washerwoman. When pinched up the folds disappear slowly. The temperature rapidly falls and the surface soon has a deathlike coldness, particularly over exposed parts, though it is stated that the temperature within the body is usually increased. In the mouth it ranges from 79° to 88° , in the axilla from 90° to 97° (Goodeve). In the vagina and rectum it is considerably higher. The circulatory organs and blood give evidences of grave disturbance. The radial pulse is exceedingly feeble and thready or even extinct, and in bad cases no pulsation can be felt in the brachial or even in the carotid arteries, while the cardiac impulse and sounds become extremely weak or almost imperceptible. The general capillary circulation is seriously embarrassed. When a vein is opened little or no blood escapes, this being thick, viscid, and tar-like. The respiratory functions are also impeded. There is paroxysmal dyspnoea, with gasping for breath, and a sense of oppression and craving for air, at last almost continuous. The expired air is cold and very deficient in carbonic anhydride. The voice is extremely weak, often whispering or entirely inaudible. The nervous system necessarily suffers severely. As a rule muscular prostration is marked, but the strength is now and then wonderfully retained. There is great restlessness and jactitation with wakefulness, the patient tossing about and throwing off the bed-clothes. At first much anxiety is felt, but this soon changes into apathy and indifference. Occasionally headache, giddiness, tinnitus aurium, *muscae volitantes*, or cloudiness of vision are complained of. The mind is at first clear, though inactive, but in cases ending fatally stupor sets in, followed by coma. Reflex excitability is markedly impaired. Cramps continue from time to time.

A prominent feature of this stage is the impairment or complete cessation of the functions of absorption and secretion. No saliva is formed; while the urine is almost entirely or quite suppressed. At this time the purging and vomiting diminish in amount and frequency, though there may be much retching; the stools are less liquid usually, and contain mucus or gelatinous masses; they are often passed in bed. Ultimately they may become extremely offensive, the smell resembling that of decomposed fish. Intense thirst is experienced, with a sense of heat in the epigastrium, the patient constantly craving for cold drinks, which are swallowed with spasmodic avidity, probably to be immediately rejected. The tongue feels cold.

The intensity of the symptoms described varies much. When they

are developed in their full severity recovery seldom takes place, death occurring more or less speedily, preceded by signs of more and more interference with the respiratory functions, increased capillary stagnation, and coma. In most cases the temperature rises with the approach of death. In the less marked cases, however, recovery follows not unfrequently, and there is no condition which is utterly hopeless. The phenomena attending restoration will now be considered.

4. *Stage of Reaction*.—The signs indicating restoration are a gradual change in the expression, general aspect, and color; improvement in the pulse and cardiac action, with diminution in the capillary stasis; and return of heat to the surface; breathing becoming at the same time more regular and calm; while the restlessness, thirst, and other symptoms abate, and the secretions are re-established. The patient often falls into a calm doze; vomiting ceases, but a little purging may continue, the stools, however, containing bile. There is said to be no actual rise of temperature at the beginning of reaction, but a cooling of the interior parts of the body while the outer parts warm up (Jüterbogk). This stage may terminate in speedy convalescence, but this is often not the case, certain *complications* or *sequelæ* being very liable to happen, or now and then a *relapse* taking place, which may prove fatal. Occasionally also the reaction is imperfect, and the symptoms continue more or less, there being no pyrexia, the patient dying in a few days, or sinking into a typhoid state, or ultimately making a slow progress to recovery. A most important matter during the progress of convalescence is to look for the restoration of the secretions, especially the urine. The temperature not unfrequently rises above the normal without any obvious cause.

COMPLICATIONS AND SEQUELÆ.—Among the less important of these mentioned by Dr. Goodeve are mild consecutive fever, with general disturbance, which may assume a remittent or intermittent type, usually ending in recovery in a few days; obstinate vomiting, often associated with more or less gastritis, which may become very serious; frequent hiccough, with gaseous eructations and loss of appetite; and want of sleep. The more grave complications usually met with are acute desquamative nephritis with uræmia, which may become chronic; "cholera typhoid;" severe enteritis, which may be of a diphtheritic character; chronic diarrhœa or dysentery; low pneumonia or pleurisy. The urine is usually albuminous, and may contain some hyaline casts during convalescence, but in favorable cases it soon becomes normal. In some instances, however, it assumes the characters indicating acute renal disease, along with the other symptoms of this condition, and signs of uræmia. The term "cholera typhoid" has been used vaguely; the symptoms are merely those pertaining to the "typhoid state" generally, and they may be associated with uræmia; with any adynamic inflammation; or be independent of visible morbid changes, being then

probably due to blood-poisoning. The temperature rises if inflammatory complications set in.

A cholera-eruption or exanthem has been described, but though erythematous, maculated, papular, urticarial, or even purpuric eruptions appear in some instances, there is none characteristic of cholera.

As occasional sequelæ are mentioned inflammation of the genitals; parotid bubo; ulceration of the cornea and its consequences; gangrene of various parts; bed-sores, boils, ulcers, etc. In many cases, especially if the illness has been prolonged, a condition of marked debility and anæmia remains behind.

VARIETIES.—In some cases the collapse stage sets in after little or no previous purging or vomiting, death ensuing very speedily. On the other hand this stage may be imperfectly developed. During an epidemic of cholera numerous cases of diarrhœa are met with, lasting several days, generally unattended with pain, to which the terms “choleraic diarrhœa,” or “cholerine,”* are applied. The stools are usually pale, liquid, and copious; and there may be vomiting and cramps, while the patient feels much exhausted and seriously ill. These cases have been regarded as the result of a milder dose of the cholera poison, and they may pass into true cholera, though sometimes they prove fatal independently of this. Towards the end of some epidemics the choleraic diarrhœa passes into a kind of low fever.

Here also may be mentioned the so-called *sporadic, bilious, or English cholera*, or *summer diarrhœa*, the symptoms of which sometimes closely resemble those of true cholera. Ordinarily they are less severe; the stools and vomited matters contain bile; there is more griping; urine is not entirely suppressed; the duration is longer; while the mortality is much less (Goodeve). Some cause, such as an error in diet, can generally be found for the attack.

PATHOLOGY.—All authorities seem agreed that cholera is primarily due to the action of some specific morbid poison upon the system, the nature of which is at present doubtful. Beyond this point there are wide divergences of opinion. Dr. G. Johnson and others consider that all the phenomena of cholera are due to this poison, which acts first on the blood, in which it is enormously multiplied, and then affects certain portions of the nervous system, especially the sympathetic and the nerve centres influencing the respiratory and circulatory organs, thus leading to paralysis of the coats of the intestinal smaller arteries and capillaries, with consequent free transudation, while the small vessels of the lungs are spasmodically contracted and will not allow the blood to pass through these organs. According to this view the purging and vomiting are regarded as eliminatory of a morbid poison. Another class of patholo-

* The term “cholerine” has also been applied by Dr. W. Farr to the poison which originates cholera.

gists believe that the cholera-poison acts directly on the alimentary canal, and that the subsequent phenomena of collapse are the consequence of the intestinal disease, and of the violent purging and vomiting accompanying it, being due to the physical changes in the blood and disturbance of the sympathetic nerve thus induced. The blood does undergo some very marked alterations. As already stated, it becomes very thick and dark. Water is rapidly withdrawn, both from the liquor sanguinis and the corpuscles, and hence a serious disturbance in the relations of these to each other arises. Soon also the proportion of saline ingredients is much diminished, while that of the organic elements is relatively increased, especially the corpuscles and albumen. The specific gravity is considerably raised. Occasionally the blood is acid. During the collapse stage it may contain urea and other products of decomposition, some of which may result from changes in the stagnant blood itself. In the reaction stage these are often very abundant. Drs. Lewis and Cunningham have described peculiar microscopic changes observed in choleraic blood removed during life, as well as in that obtained after death, viz., the rapid development and multiplication of active bioplastic bodies, ultimately forming cells; and they consider that these changes may go on in the body, and that this may account for the abundant bioplasts and cells found in the cholera evacuations. The alterations in the blood will explain the thirst; the drying up and shrivelling of the tissues; and also, to a great degree, the capillary stagnation; disturbance of the respiratory and circulatory functions; and suppression of secretions. At the same time these phenomena are partly to be accounted for by the influence exerted upon the heart through the sympathetic, the feeble action of this organ aiding in producing many of the symptoms, because it cannot drive the blood through the vessels. The dyspnoea is also to some extent due to the pulmonary collapse. The cyanotic appearance is partly the result of the stagnation of blood; partly of its concentrated and venous character.

It is important to note that the fact of purging ceasing during the collapse period does not imply always that fluid has ceased to transude, for at this time the intestines are often paralyzed, and may contain a large quantity of fluid which they are unable to expel.

The phenomena which characterize the reaction-stage are due chiefly to the impurities which accumulate in the blood, and they are more liable to arise in proportion to the duration of the collapse stage, and to the length of time which elapses before secretion is properly set up after reaction has commenced. They are probably promoted in some cases by improper employment of stimulants and drugs.

PROGNOSIS—MORTALITY—DURATION.—It need scarcely be remarked that the prognosis in cholera is always very grave. The mortality

varies in different epidemics, ranging from 20 or 30 to 70 or 80 per cent.; it is higher in the early part of an epidemic. On an average more than half the cases recover. The chief general circumstances rendering the prognosis worse are infirmity and old age; unfavorable hygienic conditions; previous intemperance; debility from any cause; the existence of renal disease. During the actual attack the prognosis, both immediate and remote, is more grave in proportion to the rapidity with which signs of collapse set in, as well as to their intensity and duration. Rapid cessation of pulsation in the larger arteries; great disturbance of the respiratory functions; a striking fall in temperature; marked cyanosis; or tendency to coma, are all very bad signs. The cessation of purging is sometimes unfavorable, indicating paralysis of the intestines. When reaction sets in there are many dangers to be feared, but a more favorable progress to convalescence is to be expected in proportion to the rapidity with which the functions of secretion and absorption are re-established, and to the continuous and regular improvement in the symptoms. Most of the subsequent complications or sequelæ are exceedingly serious.

The duration of cases of cholera may range from a couple of hours to some weeks, reckoning in its sequelæ. The average duration of fatal cases is about from two to three days. The length of each stage varies considerably.

TREATMENT.—The *preventive treatment* of cholera is extremely important, and first calls for consideration. During an epidemic of this disease all the rules laid down in a former chapter as to the management of contagious diseases and epidemics must be rigidly carried out, under the personal superintendence of competent individuals. Cleanliness and free ventilation are highly important. Particular attention is demanded with regard to the choleraic stools, which should be immediately disinfected, and so disposed of that there is no danger of their becoming mixed with drinking-water, care being taken that the sewers and drains are kept in good order, and that they are well flushed from time to time with disinfectants. On no account must the excreta be recklessly thrown out on the ground, and if there is no proper place to receive them, they should be buried at a considerable depth in the earth, away from all habitations. Most important is it to attend to the water-supply, and to see that the water used is abundant and pure. It should always be filtered. Food must also be looked to, and especially milk. Persons should be warned against errors in diet, intemperance, and other injurious influences, and everything must be done to calm the minds of those inhabiting an infected district, and to prevent needless fear and depression. During epidemics it is very properly the custom to organize staffs of medical men and their assistants, in order to carry out thoroughly all the necessary preventive measures, and to treat cases as soon as they arise, house to house visitation being prac-

ticed daily. If possible, it is highly desirable for persons to remove from infected districts.

With regard to the disposal of the dead, the bodies should be buried as soon as possible, each being surrounded in its coffin with some disinfectant, such as a mixture of charcoal, lime, and carbolic acid. An apartment which has been occupied by a cholera patient must be thoroughly disinfected and cleansed, and it is often necessary to destroy clothing and bedding.

The *curative treatment* of cholera is unfortunately in many cases quite hopeless, but often much may be done, particularly at an early period of the complaint. It is a great mistake to follow a routine plan in all cases, but the practitioner should be guided as to the measures to be employed by the actual condition of the patient and the stage of the disease. Personal attention on the part of the medical man is desirable, so far as this is practicable, in order to see that the treatment is properly carried out. The earlier this is commenced the more likely is it to be successful, and patients should take to their bed at once. During a cholera epidemic the slightest case of diarrhœa ought to receive the most prompt attention, and the public should be instructed on this point, and places established where they may at once obtain the necessary medicines.

In the *evacuation stage* two directly contrary plans of treatment have been employed, most practitioners using measures for checking the diarrhœa; a few encouraging it, acting on the principle that it is eliminatory of a poison. Dr. G. Johnson gives castor oil at frequent intervals. Others have advocated the use of calomel, sulphate of magnesia, and other purgatives. Undoubtedly in some cases of early choleraic diarrhœa a dose of castor oil is beneficial, with the view of getting rid of irritant matters; but, apart from all theoretical considerations, experience has proved that the systematic employment of this plan of treatment is by no means favorable. Most decidedly the evacuations ought to be checked as soon as possible, in my opinion. Opium is the great remedy for this purpose, the best preparations being the pill, tincture, liquor opii sedativus, or Dover's powder, the liquid preparations answering best if there is much vomiting, or if speedy absorption is required. This drug, however, requires much care in its employment in cholera. Should there be signs that the collapse-stage is approaching particular caution is necessary in administering it, while it is inadmissible if this stage has become established. If the indications are favorable, it seems best to give a full dose at once and then repeat it in smaller quantities as it is needed. Should the first dose be vomited it must be repeated after a short interval. Various astringents are also useful, especially acetate of lead (gr. ij—iij); tannic or gallic acid (gr. x—xx); and dilute sulphuric acid. Some prefer giving opium by itself, and administering the remedies just mentioned between times;

others combine them with the opium. The experience of some cases seems to indicate that the encouragement of very free sweating at the commencement of an attack of cholera may be beneficial.

In the *collapse stage* opium must on no account be given, but if purging continues one of the astringents mentioned above may be employed. Most reliance can be placed at this time in the judicious use of stimulants. Before indications appear that collapse is setting in these are not called for, but as soon as any weakness of the pulse is observed or other signs of sinking, they should be commenced. The practice of pouring in large quantities of stimulants is to be highly deprecated, and their administration needs the most careful regulation. The best alcoholic stimulants are brandy with iced water and champagne. They must be given in small quantities; at more or less frequent intervals according to circumstances; and their administration must be mainly guided by their influence upon the pulse. If the purging has ceased, brandy may be given in enemata with beef tea. Diffusible stimulants are also of service in this stage, viz., aromatic spirits, solution, or carbonate of ammonia; the various ethers; camphor, which has been vaunted as a specific; musk, and similar remedies. These may be combined with essential oils of peppermint, cinnamon, or cajeput. Niemeyer found a few cups of hot strong coffee useful in some cases.

With regard to diet, it is useless to give any nourishment at the commencement, as this is only rejected immediately. A little beef tea, chicken broth, or arrowroot and milk may be tried at a later period, if the vomiting ceases. The patient should be allowed an unlimited supply of ice to suck throughout, which Macnamara considers invaluable in the treatment of cholera, but he lays great stress on prohibiting every drink until the collapse stage sets in, when iced water in moderation may be permitted. Enemata of iced water, or, on the other hand, those of warm milk have been recommended.

Local measures are often of much service for the relief of symptoms. A large mustard poultice should be applied at once over the abdomen, and repeated as required. For the cramps, hot bottles, sinapisms, and friction, either with the hand alone or with turpentine or chloroform liniment, may be employed. If they are very severe, inhalation of chloroform is admissible. In the collapse stage Niemeyer recommended the application of cold compresses over the abdomen.

Should reaction set in the utmost care must be exercised, and the natural progress towards convalescence must not be interfered with by needless medication. The diet needs particular attention, only the blandest liquid food being allowed in moderate quantities, and this regulation of food is demanded until the patient has been entirely restored, it being improved gradually as the stools become natural. Water may be freely allowed at this time, and it has been recommended to dissolve some salt and carbonate of soda in it, in order to

replace the loss of these salts. It is highly important to watch for the re-establishment of the secretions, and, if necessary, measures may be adopted to encourage this. Complications and sequelæ must be treated as they arise. It need only be mentioned here that it is not always desirable to check diarrhœa at this time, should the stools be very offensive, and that inflammatory affections require a supporting treatment. Tonics and iron are often serviceable during convalescence.

It is important to pay strict attention to the cleanliness and ventilation of the sick-room, and to see to the immediate removal and disinfection of wet and soiled bed-clothes, it being advisable also to have a mackintosh placed under the patient. Due precautions must be taken against bed-sores, frequent examination of parts pressed upon being made. Should the urine be retained, the bladder must be emptied by means of the catheter; if it is suppressed, hot applications over the loins and dry-cupping are indicated.

For such a disease as cholera it is not to be wondered at that innumerable specific modes of treatment have been advocated, but all have proved equally inefficient. Without making any comment, I merely mention some of the most prominent, viz., the administration of saline salts, chiefly carbonates and chlorides, either freely by the mouth, by enema, or by injection of a warm solution into the veins; the use of warm, vapor, or hot-air baths, or of the wet sheet; application of ice to the spine; the employment of antiseptics, such as carbolic acid, sulpho-carbolates, chloralum, etc.; inhalation of oxygen; inhalation of nitrate of amyl; calomel, gr. j—ij, at frequent intervals; bisulphide of mercury. The various cholera drops and pills which are in repute in different countries are made up of stimulants, generally combined with some preparation of opium.

CHAPTER XX.

GLANDERS AND FARCY—EQUINIA.

ETIOLOGY.—These affections, which are occasionally observed in man, are transmitted from the horse, ass, or mule. It is doubtful whether they are distinct diseases, or varieties of the same malady. They are produced by the inoculation or contact of a *specific poison*, which is contained chiefly in certain discharges, but also in the excretions, secretions, and blood; and they are rarely met with except among those whose occupation brings them much into contact with horses, viz., hostlers, grooms, etc.

Glanders may be propagated in consequence of a horse snorting and thus expelling a quantity of the discharge from the nostrils on to an individual, or into the surrounding air, from which it is afterwards inhaled. The poison may be conveyed by fomites to which the discharges become attached. It is even said that glanders may arise from breathing the atmosphere of a stable inhabited by glandered horses. These diseases can be retransmitted to the horse and ass, as has been proved experimentally, and there is reason to believe that they are capable of being communicated from one human being to another.

ANATOMICAL CHARACTERS.—Glanders and farcy are characterized by certain peculiar morbid changes. In the former hard nodules form in connection with the mucous membrane of the nose, mouth, throat, and respiratory passages; as well as in the lymphatic glands, skin, subcutaneous tissue, muscles, lungs, and other organs. These are made up of cells, the result of proliferation, which soon degenerate, the nodules rapidly becoming soft and breaking down, forming abscesses and ulcers. The Schneiderian membrane is inflamed, and presents little pustular elevations or patches, which finally break out into excavated ulcers, and may lead to necrosis of the cartilages and bones, with perforation of the septum. The frontal sinuses may contain a puriform fluid. The larynx, trachea, and bronchi are also frequently affected. The lungs present pneumonic patches or abscesses. Small yellow elevations may be seen on the pleuræ, with fibrinous deposits underneath. The lymphatic glands are enlarged, softened, and reddish. Superficial petechiæ, ecchymoses, or gangrene are sometimes observed, or there may be suppuration or gangrene of the subcutaneous tissues or of the substance of the muscles. A peculiar eruption appears on the skin.

Farcy differs from glanders in the nasal mucous membrane not being affected, but so-called tubercles, buds, or tumors form in connection with the skin, which break down into deep, unhealthy ulcers; or the lymphatic system may be chiefly involved.

The appearances differ considerably, according as these diseases run an acute or chronic course.

SYMPTOMS.—*Acute Glanders.* The period of incubation is usually from three to eight days. After inoculation local signs of inflammation appear first as a rule, the neighboring lymphatics being also affected. Ordinarily the disease is ushered in by such general symptoms as rigors, languor, pains in the limbs and joints, headache, often vomiting and diarrhœa, with a certain degree of pyrexia. Soon subcutaneous formations are noticed, especially on the face and near the joints, which quickly change into abscesses containing unhealthy and fetid pus. Over these the skin becomes red or violet, and sometimes limited gangrene sets in. Usually a peculiar cutaneous eruption appears, especially on the cheeks, arms, and thighs. It begins as small, intensely red spots, which soon become papular and afterwards pustular. The pus-

tules vary much in size and number, are flattened or acuminate at the summit, and often have a red areola. Sometimes the contents become sanguineous and dry up into small blackish-brown crusts. This eruption is not due to any exudation under the cuticle, but to circumscribed destruction of the true skin. Dark bullæ often appear also on the face, trunk, fingers or toes, and organs of generation, followed by gangrene. Erysipelatous inflammation of the nose, eyes, and surrounding parts is not uncommonly observed, which may extend to the scalp. The eruption is preceded and accompanied by profuse fetid sweats.

A prominent symptom of glanders is a discharge from the nose, at first thin and scanty, but soon becoming abundant, purulent, viscid, extremely fetid, and often sanious. It clogs the nostrils and obstructs breathing, while it escapes through the posterior nares, causing much distress and irritation. A thick matter also comes from between the eyelids, and sometimes from the mouth, which is then the seat of ulceration and pustules. The submaxillary lymphatic glands may be enlarged.

The constitutional symptoms increase in severity as the case progresses, being more or less of a typhoid character, and indicative of septicæmia. Thus there is marked prostration, with a brown and dry tongue, and a very rapid, feeble, and irregular pulse. Diarrhœa and tympanitis are frequent symptoms, the stools being exceedingly fetid and sometimes bloody. There is also dyspnœa, with hurried breathing, hard cough, with but little expectoration, weak voice, and foul breath. Delirium and coma ultimately set in, and death terminates the scene, in most cases at the end of the second or beginning of the third week, but it may happen much earlier or later than this.

Chronic glanders is very rarely met with, and is usually a sequel of farcy. Its chief symptoms are lassitude and articular pains; sore throat; disagreeable or painful sensations in the nose, with more or less puriform and bloody discharge; cough with expectoration, dyspnœa, and altered voice. After a time ulceration may be observed on the mucous membrane of the nose, followed by caries or perforation. The pharynx may also be ulcerated. There is no eruption. The general symptoms are less marked than in the acute form, but the latter may supervene. The duration of chronic glanders is very variable.

Acute Farcy.—The great difference between this affection and glanders lies in the want of implication of the nares. In one class of cases the eruption is present: in another there is no eruption, but merely inflammation of the lymphatic glands and vessels, with soft tumors under the skin, named *farcy buttons* and *farcy buds*. The former are by far the more serious.

Chronic Farcy.—After constitutional symptoms, subcutaneous tumors form, which become abscesses, and these discharge their contents, leaving foul, deep, and indolent ulcers. As a consequence there is

wasting with great debility. The complaint may end in true glanders; or death may result from exhaustion or pyæmia. Occasionally recovery takes place. The duration is very variable.

An affection termed *equinia mltis* is described, derived by contagion from horses suffering from the "*grease*." The symptoms are fever, depression, with shivering, and a pustular eruption, which dries up into scabs, and these fall off, leaving distinct scars.

PROGNOSIS in all these affections is very grave, for they almost always prove fatal. *Chronic farcy* may terminate in recovery.

TREATMENT.—The most important matter is to exercise due precautions for the prevention of these diseases. If inoculation should happen, the affected spot must be immediately destroyed by some escharotic. A supporting, stimulating, and tonic plan of treatment is the only one which offers any chance of success in dealing with either of these affections, at the same time strict attention being paid to cleanliness and other hygienic conditions. Abscesses must be opened as they arise. Antiseptics internally might be of service.

MALIGNANT PUSTULE—CHARBON.

ETIOLOGY.—In this country malignant pustule is of extremely rare occurrence in the human being. It is a disease which is transmitted to man mainly from sheep and oxen, these, as well as horses and other animals, being liable to the malady, under the names of "joint-murrain," "black quarter," etc. The poison is usually conveyed by direct inoculation, the matter being brought in some way or other into contact with an abraded or wounded surface; but there is reason to believe that it may be absorbed by the unbroken skin in parts where this is very thin. Flies and other insects have been supposed to be instrumental in carrying the poison from affected animals to human beings. It is also probable that the complaint may arise from eating the flesh of cattle suffering from it. The large majority of cases have been met with in healthy adult males.

SYMPTOMS.—Almost always some exposed part is inoculated, often the lip or some other part of the face, and at this spot the local signs of malignant pustule are first perceived. There is at the outset a little redness here, like that produced by the bite of a gnat, but very soon a small vesicle forms, attended with much itching or stinging, causing the patient to scratch. In a short time the tissues around rapidly swell and become hard, brawny, and discolored, until ultimately the part affected assumes a black and gangrenous appearance. There is a surrounding erysipelatous areola, upon which secondary vesicles form; while the absorbent vessels and glands in the vicinity become inflamed. A fetid odor arises, and if the lip is affected, saliva escapes in abundance, and the breath is extremely fetid. Soon general symptoms in-

dicative of blood-poisoning set in, viz., great prostration, cold clammy sweats, very weak and rapid pulse, hurried respiration, low delirium, and other nervous phenomena. The great majority of cases terminate fatally.

PROGNOSIS is necessarily very grave, but recovery occasionally takes place, if energetic treatment is carried out at an early period.

TREATMENT.—As early as possible the affected spot should be incised, and effectually cauterized by means of potassa fusa or the actual cautery. Some disinfectant application should afterwards be used, such as a solution of carbolic acid. The patient must be kept in a well-ventilated apartment, and have abundant nourishment, with alcoholic stimulants. Quinine, tincture of steel, and mineral acids are the most reliable internal remedies. A solution of chlorate of potash may be used as a drink. Antiseptics internally might perhaps be serviceable.

CHAPTER XXI.

HYDROPHOBIA—RABIES.

ETIOLOGY.—Hydrophobia is unquestionably a *specific contagious disease*, resulting from the action of a *specific poison* of unknown nature, which in the human being is almost invariably introduced into the system through the bite of a mad dog inflicted upon some exposed part of the skin, but is in rare instances transmitted from other allied animals, as the cat, wolf, or fox. Only a small proportion, however, of those bitten by dogs actually suffering from rabies take the disease. It may be conveyed in consequence of a dog merely licking an exposed surface; and it has even been supposed that the poison may be absorbed by the entire skin, where this is thin. The contagium is contained mainly in the saliva or buccal secretion. Some affirm that the disease can be transmitted from man to man. Mental anxiety has been presumed to predispose to hydrophobia, but there is no reliable evidence of this.

ANATOMICAL CHARACTERS AND PATHOLOGY.—There are no absolutely characteristic morbid appearances associated with hydrophobia. The most important which have been observed are in connection with the brain and spinal cord, viz., congestion of the meninges, with coagula in the sinuses; excess of fluid in the ventricles; effusion of blood and serum around the upper part of the cord, with small extravasations of blood in its substance. There may be increased vascularity of the fauces, and occasionally a deposit of lymph is observed here. Post-mortem congestion of dependent parts is common.

It is supposed that the poison of rabies undergoes a kind of fermentation, and becomes increased both at the wound and in the system. It then acts upon the blood, and subsequently is presumed to affect the eighth pair of nerves and the medulla oblongata, which will account for the phenomena observed.

SYMPTOMS.—A very indefinite *period of incubation* intervenes between the introduction of the poison and the development of the symptoms of hydrophobia. About forty days is said to be the average, but it may vary from fifteen days to many months, or, it is said, even years. In some cases unusual objective appearances or subjective sensations are developed in connection with the cicatrix of the bite before the symptoms break out, such as redness, itching, etc.

When the disease begins to declare itself the patient feels uncomfortable, low-spirited, despondent, restless, has an undefined feeling of anxiety or dread, and complains of giddiness or alternate chills and heats. Then follows a sense of oppression in the chest, with involuntary deep sighing inspirations from time to time, or a sudden catch in the breathing may first occur, attended with severe pains in the epigastrium, due to spasm of the diaphragm. The subsequent characteristic symptoms are grouped by Mr. Erichsen as: 1. Spasmodic affection of the muscles of deglutition and respiration. 2. Extreme sensibility of the surface and of the special senses. 3. Excessive mental terror and agitation. The nature of the malady is generally revealed to the patient by a fit of choking brought on by an attempt to drink, and by finding that swallowing is impossible. This condition becomes rapidly worse and worse, each attempt at drinking bringing on a spasm of the muscles of deglutition and respiration, which is attended with a feeling of intense oppression and suffocation, causing great distress. Not unfrequently solids can be swallowed at first without producing any disturbance. Soon the sight or sound of any liquid, or anything that even suggests drinking, brings on the spasmodic attacks, and the patient spits out the viscid secretion which forms in abundance in the mouth as fast as it is produced, so as not to be tempted to swallow it. Soon the skin and special senses become extremely sensitive, so that the least touch or a sudden sound or light will bring on the spasms, which ultimately extend to other muscles, assuming more or less the characters of general convulsions. The patient is in a state of great terror, anxiety, and depression, combined with restlessness. Often fits of furious mania subsequently occur, in which the patient is extremely dangerous and utters strange sounds, which has given rise to the idea of barking being a symptom of this disease. In the intervals the intellect is generally quite clear. Sometimes there are curious persistent delusions. As the case progresses towards a fatal termination, which is always the final result, the special symptoms diminish or may even disappear altogether, and the patient gradually sinks from exhaustion and collapse.

Rarely death occurs suddenly from suffocation during a fit of spasm. The duration of the disease is from three to five or six days.

TREATMENT.—The great thing is to prevent hydrophobia, by immediately cauterizing the part bitten by means of nitrate of silver, the hot iron, or potassa fusa; or by complete excision. Other modes of preventive treatment are quite useless. The patient's mind should be calmed as much as possible, and he should be prevented from brooding over his danger. There is no remedy that I know of of any real service for the cure of hydrophobia, once the disease has become developed. Relief might be afforded by subcutaneous injection of morphia, atropine, or curara; the application of the ice-bag to the spine; and inhalation of chloroform.

CHAPTER XXII.

DENGUE—DANDY FEVER—BREAKBONE FEVER.

ETIOLOGY.—Dengue is a peculiar epidemic fever which attacks a great number of people in rapid succession. It is not met with in this country, but prevails in America, the East and West Indies, and other parts. It is not known what the actual cause is; some believe it to be a contagious complaint, but the evidence on this point is insufficient.

SYMPTOMS.—After an incubation period of from twenty-four hours to ten days, the invasion is usually somewhat sudden, the symptoms being chilliness, a sense of debility and uneasiness, with violent pains in the muscles of the limbs and back, as well as in a variable number of joints, which are somewhat swollen. There is also headache, and the alimentary canal is often disturbed, but the tongue remains clean. At first the symptoms very much resemble those of rheumatism. Soon fever sets in, and sometimes a rash or papular eruption appears. The lymphatic glands and testicles may be painful and enlarged. In from twelve hours to three or four days the symptoms subside, but debility remains, with some painful sensations. After an interval of two, three, or four days the fever and pains return, or severe headache sets in. The tongue becomes much furred, and there is considerable epigastric uneasiness, with nausea. An eruption appears on the fifth, sixth, or seventh day, especially on the upper part of the body, which presents very variable characters, either resembling that of scarlatina or measles, or being papular, vesicular, pustular, furunculous, erysipelatous, or petechial. As it disappears a scaly desquamation sometimes takes place. It is attended with itching and tingling.

The symptoms present very different degrees of intensity, and they

may assume an asthenic character. Almost all cases recover, the average duration being about eight days, but stiffness and soreness of various parts, with debility, may remain for some time, and sometimes several relapses occur.

TREATMENT.—Emetics are recommended at the outset, with free purgation. The patient must remain in bed. A saline diaphoretic mixture may be given, and opium is to be freely administered for the relief of pain. The surface may be sponged to subdue pyrexia, and cold applied to the head in order to relieve headache. The diet must be regulated, and if there are any signs of depression, stimulants and nourishing food should be given. Quinine and mineral acids are recommended during the remission and during convalescence.

CHAPTER XXIII.

PESTIS—PLAGUE.

ETIOLOGY.—This disease is of a specific nature, and generally prevails as an epidemic, but may be sporadic. Formerly it was met with in Europe, but at the present time its chief seats are Egypt, Syria, Asia Minor, and the coast of Barbary. It is undoubtedly contagious, and can be conveyed in various ways. The chief *predisposing causes* are: overcrowding and bad ventilation; want of cleanliness, with accumulation of filth; insufficient and unwholesome food; debility from any cause; a warm and moist condition of the air; residence on marshy soil or in the neighborhood of certain rivers. Epidemics often follow famine, and are generally preceded by a sickly, oppressive, warm, and moist season.

ANATOMICAL CHARACTERS.—The blood is dark and remains fluid or coagulates imperfectly, while it rapidly putrefies. All the organs are greatly congested and softened, especially the spleen; also the mucous and serous membranes, which may present petechiæ and ecchymoses. The serous cavities contain more or less effusion. The absorbent glands generally are swollen, dark, softened, or disintegrated. Buboes and carbuncles are usually present.

SYMPTOMS.—Plague is characterized by fever, generally of a low type, with the local development of buboes, carbuncles, and petechiæ. The *period of incubation* is very short, and symptoms may set in almost immediately after exposure to infection. After inoculation, the distinctive glandular swellings are developed in four days. The invasion is sudden in most cases, and the severity of the constitutional symp-

toms varies from a slight fever to one of the most virulent kind. The early symptoms are rigors, restlessness, feeling of debility and languor, headache and giddiness, nausea or vomiting, and præcordial oppression or uneasiness. The expression is heavy and stupid, and the eyes look muddy or suffused. Soon the temperature rises, while prostration increases, with a tendency to syncope. The pulse is frequent, but weak or irregular. The tongue is thickly furred, and tends to become dry and brown or black, with sordes on the teeth. The other prominent symptoms are vomiting, sometimes of black matters; great thirst; diarrhœa with offensive stools; hurried respiration; and very foul breath. The urine is much diminished and may contain blood. Hæmorrhages from mucous membranes are not uncommon. Nervous symptoms are generally present, such as delirium, stupor, coma, or convulsions. Death may take place before the appearance of any local signs.

Buboes are formed chiefly in connection with the glands of the groin, but are also seen in the axilla and about the angles of the jaws. They appear at different periods, being preceded by darting pains. Generally they form abscesses, which discharge and heal slowly, leaving permanent scars. Carbuncles are observed mostly on the limbs, but may affect any part. They vary in number and size, and are liable to end in gangrene, sometimes thus causing great destruction of tissues. Petechiæ, vibices, and livid patches are seen only in bad cases, and there may be extravasations of blood in the subcutaneous tissue.

PROGNOSIS is very grave.

TREATMENT.—Attention to all hygienic measures is essential. The bowels should be freely opened. An emetic at the outset is recommended. Nutritious food, stimulants, mineral acids, and tonics are the remedies which afford the best results. Probably those who advocate the use of antiseptics would give them largely in this disease. Cold affusion or sponging may be employed. Poultices are indicated for the buboes and carbuncles, with antiseptic dressings when they are discharging.

CHAPTER XXIV.

YELLOW FEVER.

ETIOLOGY.—There is much discussion amongst those who have had opportunities for the observation of cases of yellow fever, as to whether it is *malarial* in its origin, or of the nature of a *specific contagious disease*. Most authorities maintain the latter view, holding that true yel-

low fever is of the continued type, but that it may be simulated by malarial remittent fevers. There appears to be strong evidence to prove that the disease can be conveyed by infection, and it has thus originated in seaport towns in this and other countries, owing to the arrival of vessels with cases on board. Fomites may be the means of propagating it.

Dr. Hamilton, in an excellent Thesis on Yellow Fever, sums up his conclusions as follows:

"1. That yellow fever is the highest development of a group of diseases which depends on some unknown cause, but which appears to be in some way connected with, or dependent on, organic decomposition.

"2. That the various individual diseases of this group may change their type and pass one into the other, according to the intensity of the cause, or the more or less favorable conditions under which such cause acts.

"3. That the general laws of zymotic diseases, as observed in this country, hold good for this group also.

"4. That the same causes which augment or develop contagious properties in the zymotic diseases of this climate, will develop contagious properties in yellow fever.

"5. And that consequently yellow fever may under such circumstances become contagious and spread."

In certain regions yellow fever is endemic, and it occurs also in severe epidemics. Its principal seats are the West Indian Islands, the seaports of North and South America, the south coast of Spain, Mexico, and the west coast of Africa. It requires a temperature of at least 72° F., and is rarely met with at an altitude of more than from 2000 to 3000 feet above the level of the sea.

Among the chief external *predisposing causes* are, long-continued high temperature; a swampy or low-lying and crowded district; filthiness and other anti-hygienic conditions. The disease is more liable to attack children, males, the white races, and those who have recently come into an infected district. Intemperance and other excesses, fatigue, exposure to night air and dews, also increase the liability to the complaint, and individual predisposition seems to exist.

ANATOMICAL CHARACTERS.—The body may be emaciated or not. The skin is of a deep yellow color, as well as much congested in dependent parts and in those distant from the centre of circulation. The tissues generally are softened and flabby. More or less congestion of organs is observed, sometimes with extravasations of blood and effusions into serous cavities. Softening of the heart with molecular degeneration of its fibres is usually met with, and the blood coagulates imperfectly, though soft clots are generally found in the cardiac cavities. The stomach is the most frequent seat of morbid changes. It often contains more or less "black vomit," or blood undergoing alteration.

Sometimes a black or bloody mucus sticks in the lining membrane. Signs of congestion or inflammation are present in most cases. An inflammatory condition has been described in connection with the membranes of the cord and the sympathetic system.

SYMPTOMS.—The prominent symptoms of yellow fever vary in different epidemics, and cases exhibit all grades of intensity, from a very mild form of the disease to one of the most malignant type. Usually three stages may be recognized, following a *period of incubation*, the duration of which is usually from two to four days, but it is said it may range from one to fifteen days.

1. *Invasion stage.* The attack may be preceded by premonitory symptoms, or may come on quite suddenly. Chills generally occur at the outset, but are not always observed in tropical climates. These alternate with a sense of heat, and soon there is marked pyrexia, the degree of this being in proportion to the previous chills, the temperature presenting some morning remission. The pulse is frequent, and in most cases full and strong. The face is flushed, the eyes are red and suffused, and the expression anxious and distressed. The skin feels hot, dry, and harsh. The tongue is covered with a white fur, moist, red at the tip and edges, with enlarged papillæ. Sore throat may be complained of, and there is a constant desire for cool drinks or ice. Gastric symptoms may be present from the first, but as a rule only become prominent in from twelve to twenty-four hours. These are oppression, uneasiness, weight, or burning pain in the epigastrium, with considerable tenderness; nausea, violent vomiting, and retching, the vomited matters being of a bilious character, or containing streaks of blood or chocolate-colored flocculi. After awhile the stomach rejects everything without any effort. There is usually obstinate constipation, with unhealthy stools, deficient in bile; and there may be much flatulence. The urine is deficient and of dark color; it usually contains albumen.

Nervous symptoms are the most distressing in the majority of cases. Severe frontal headache is complained of from the first, with shooting pains in the temples and eyes. One of the earliest and most prominent symptoms, however, in most instances, is pain in the lumbar region and limbs, which often becomes so intense as to elicit screams and groans, and to make the patient writhe in agony. As this stage advances the patient becomes very restless, the mind is confused, or wild, violent delirium may set in, attended with hallucinations. Occasionally there is more or less stupor.

This stage lasts from a few hours to two or three days usually, but may extend to four or five days. It is longer in the milder cases.

2. *Stage of Remission.*—A marked improvement is observed at the close of the first stage, which in most cases is only temporary, but sometimes is permanent, convalescence setting in, preceded by critical

discharges. The symptoms subside more or less completely, the patient feeling comparatively comfortable and often hopeful, occasionally appearing to be quite well. But at this time there are frequently some unfavorable signs, viz., greater tenderness in the epigastrium; a yellowish tinge of the skin and urine; a slow pulse, and sometimes heaviness or stupor. The duration of this remission is usually but a few hours, but may extend to twenty-four hours.

3. *Stage of Collapse or Secondary Fever.*—In most cases signs of collapse appear, with great prostration and debility. The skin generally assumes a yellow, orange, or bronzed hue, but not invariably. This spreads from the forehead downwards, and is dependent upon the coloring matter of the blood. The circulation is impeded, the pulse becoming very rapid, weak, and irregular, and capillary congestion or stagnation being observed in dependent and distant parts, with sometimes petechiæ and vibices; at the same time the heart may be beating violently. In bad cases hæmorrhages are common, especially from the mucous surfaces. The tongue tends to become dry, brown, or black; or it is smooth, red, and fissured; at the same time sordes may form on the lips and teeth. The gastric symptoms return and become very intense. The so-called "black vomit" sets in by degrees, the black color being probably due to altered blood. It is often preceded by "white vomit." Black vomit is not a constant symptom, and its exact characters vary, sometimes pure blood being discharged. Similar matters may pass off in the stools. The urine is often more or less deficient, and contains albumen; it is sometimes entirely suppressed or retained. The patient frequently lies in a state of apathy and gloomy indifference. Ultimately collapse becomes extreme, with a cold, clammy skin; slow, sighing respiration, and hiccough. Consciousness may be retained to the last, or low delirium or coma may set in, with convulsions at the close.

In some cases the symptoms are those of more or less secondary fever, instead of collapse. This course of events may terminate in convalescence; or the fever assumes a typhoid type, ending fatally.

VARIETIES.—As already stated, great differences are observed in the intensity of the symptoms of yellow fever, and also in the nature of those which are most prominent in different cases. Some patients are prostrated at once and die very speedily.

The named varieties are: 1. Algid. 2. Sthenic. 3. Hæmorrhagic. 4. Petechial. 5. Typhous. The several terms imply the prominent characters peculiar to each.

PROGNOSIS.—Yellow fever is always a terrible disease, but the mortality varies much in different epidemics. Death usually takes place from the fourth to the sixth day, but may be delayed to the ninth or eleventh day, or even to a much later period than this. It has been observed that many apparently hopeless cases recover, while others,

which seem to be mild, prove speedily fatal; hence the prognosis is very uncertain. A concise list of favorable and unfavorable signs is given by Dr. Macdonald, in Reynolds's *System of Medicine*, vol. i, page 492.

TREATMENT.—Attention to all hygienic measures and rules of health is of prime importance. At the outset hot drinks and warm foot-baths have been recommended, with emetics and purgatives. Large doses of calomel or of quinine used to be given, but they have been proved to be injurious.

It is important to excite the excreting organs to act freely as soon as possible. Copious enemata, containing turpentine, are serviceable. Saline drinks may be given abundantly. The skin should be sponged, or the wet sheet may be employed if the patient is very hot.

Liquid food should be given in small quantities, with cool drinks and plenty of ice. Alcoholic stimulants, well diluted, are also valuable. Champagne is very beneficial. Various symptoms require attention, but especially vomiting. For its relief lime-water and milk, hydrocyanic acid, creosote, chlorodyne, and chloroform, have been found most useful. Great care must be exercised in the administration of opium or morphia, particularly if there is any tendency to suppression of urine. Chlorodyne is suggested as a substitute, in order to procure sleep and relieve pain; hot applications or mustard poultices being also applied externally over painful parts. Hæmorrhages, collapse, and typhoid symptoms must be treated by the ordinary remedies. During convalescence quinine may be given.

CHAPTER XXV.

CEREBRO-SPINAL FEVER—EPIDEMIC CEREBRO-SPINAL MENINGITIS.

ETIOLOGY.—This complaint prevails as an epidemic, and presents the characters of an *acute specific disease*, but its *exciting cause* is by no means definitely made out. There is no reliable evidence that it is at all contagious. It has been attributed to the action of a malarial poison; to excessive fatigue; the use of unwholesome food, especially diseased grain; or exposure to cold. Among the chief *predisposing causes* are early age, especially from 15 to 30, the complaint being uncommon after 35 and very rare after 40, but not infrequent in children; the male sex markedly; and a cold season, most cases occurring in winter or early spring. Unfavorable hygienic conditions do not seem to have

much influence. Cerebro-spinal fever is met with as an epidemic principally where young people are collected together, and it is particularly common among young recruits in barracks.

ANATOMICAL CHARACTERS.—The most important morbid changes observed in cases of cerebro-spinal fever are those indicative of inflammation of the membranes of the brain and spinal cord. There is hyperæmia of the scalp and of the structures within the cranium, the sinuses of the dura mater containing much dark fluid or softly coagulated blood. There may be small hæmorrhagic effusions in connection with the dura mater. The subarachnoid space contains excess of serum, but the most striking appearance is due to the presence of more or less exudation here, both over the convexity and at the base of the brain, but it is much more abundant in the latter situation, the cranial nerves being often imbedded in it. The amount and characters of this material vary with the duration of the disease; in cases of very short duration it is generally in small quantity, whitish and soft; later on it becomes more abundant, yellowish or greenish, and somewhat purulent-looking; while in prolonged cases it is again whiter and firmer, there being also more serum then. The brain-substance is too vascular and may be softened, especially in the neighborhood of the ventricles, which contain in many cases a small quantity of purulent-looking fluid, or occasionally much serum.

The membranes of the cord present similar changes, there being a purulent fluid under the arachnoid, with exudation, which is almost entirely confined to the posterior surface.

Rigor mortis is well marked. Post-mortem congestion rapidly sets in, and purpuric patches are usually visible. The blood is dark and tarry-looking, and the muscles are of a deep color. The spleen, liver, and lungs, are often much congested, and there may be signs of inflammatory complications. Purulent infiltration of the eyeball has been occasionally met with, as well as effusion into the joints.

SYMPTOMS.—In the great majority of cases cerebro-spinal fever is not ushered in by any premonitory symptoms, and the invasion is quite sudden, with a rigor or chill; faintness; intense headache, causing the patient to cry out, and being more or less general, but sometimes localized, especially at the back of the head; vertigo; frequently epigastric pain and cerebral vomiting, the vomited matters being generally of a bilious character; great restlessness; and pyrexia. The pupils are contracted. In a day or two the pain extends to the back of the neck and then down the spine, being increased in this locality by movement and pressure. The head is drawn back, partly voluntarily in order to relieve pain, partly from spasm of the muscles. In three or four days distinct tetanic spasms set in, there being often well-marked opisthotonos, and occasionally trismus, risus sardonicus, or strabismus. The respiratory muscles may become involved, causing serious inter-

ference with breathing. The skin generally becomes extremely sensitive, and severe pains are felt in the limbs, these being aggravated or sometimes only produced by movements of the spine. At first the mind is clear, but soon mental confusion is observed, followed by muttering delirium, and then by stupor, which in fatal cases ends in deep coma. In rare instances epileptiform convulsions occur, or there may be hemiplegia, paraplegia, or signs of paralysis of some of the cranial nerves. Amaurosis is occasionally noticed, and deafness is not uncommon.

Early in the course of the disease herpes usually appears, chiefly about the lips and face, but it may be on the limbs or trunk. Other forms of eruption are sometimes seen, and the body becomes more or less thickly scattered over with purpuric spots in bad cases, in some instances considerable patches being involved, which may become quite black or even gangrenous; in such cases mucous hæmorrhages are also liable to occur. The degree of pyrexia varies much in different cases, but the temperature usually ranges from 100° to 103° , in some instances, rising to 105° or higher. It has no regular course, often presents sudden variations, but there is generally a slight evening exacerbation. The pulse rises to 100 or 120, but is liable to considerable changes in frequency; it is sharp, weak, and wanting in tone. The respirations are hurried. The bowels are constipated and the abdomen is retracted. The urine may contain a large quantity of albumen in severe cases; when stupor sets in it is retained or passed involuntarily.

A favorable termination of the complaint is indicated by a gradual subsidence of the nervous phenomena, restoration of the mental faculties, and a steady fall in temperature. Convalescence is very slow, and headache usually continues for some time. There may only be partial restoration, the mind being permanently impaired, or some form of paralysis remaining; or death may take place after many weeks, from general marasmus.

Cases of cerebro-spinal fever present much variety in their severity and in their combinations of symptoms, and different writers have arranged them into corresponding groups or varieties.

COMPLICATIONS AND SEQUELÆ.—These are not uncommon, the chief being: inflammatory affections of the eyeball, especially of the right, which may end in suppuration and total destruction of the tissues; inflammation of joints ending in purulent accumulation; bronchitis, pleurisy, or pneumonia; pericarditis; and parotitis.

PROGNOSIS.—Cerebro-spinal fever is a grave malady, but the mortality varies in different epidemics from 20 or 30 to 80 per cent., the average being about 60 per cent. The early appearance of purpuric spots and the occurrence of hæmorrhages are very unfavorable signs. Death is most to be feared during the first few days, but it may take place after many weeks. The mortality is highest at the commence-

ment of an epidemic; and amongst young children and persons over thirty years of age.

TREATMENT.—If there is much depression at the outset, it is desirable to give small quantities of stimulants, and to apply heat externally. Subsequently the chief indications are to promote absorption of the exudation; to relieve the pain and spasms; to support the strength of the patient; and treat symptoms and complications as they arise. Mercury and iodide of potassium have been given with the view of aiding absorption, but the former drug seems to be quite inadmissible in the treatment of cases of cerebro-spinal fever. The application of a few leeches to the temples or behind the ears often relieves the headache. Ice should be applied constantly to the head and along the spine. In prolonged cases it has been recommended to blister the nape of the neck and spinal region. The most reliable remedies for relieving the symptoms are opium internally, or hypodermic injection of morphia; chloral; bromide of potassium in full doses; and belladonna. The patient must have nutritious and sustaining food throughout, and considerable quantities of alcoholic stimulants are frequently required. Enemata are often of much service for their administration, as well as for acting on the bowels. It is requisite to pay due attention to hygienic conditions. During convalescence tonics and good diet are necessary.

CHAPTER XXVI.

MALARIAL OR PALUDAL FEVERS.

I. ON MALARIA OR MARSH-MIASM.

THERE are certain affections which have been almost universally recognized as being the result of the action of a malarial or telluric poison upon the system. Amongst these the most striking are fevers of an intermittent or remittent type, before considering which it is therefore, requisite to indicate the main facts relating to malaria. Of the existence of such a poison there can be no doubt, though this has been denied by a few observers, some of whom have attributed the effects noticed to a chill; others to some electrical condition of the atmosphere.

1. *Origin and Propagation.*—The malarial poison is ordinarily an emanation from soils more or less rich in organic matter, which are not devoted to the maintenance of healthy vegetation. The essential conditions for its production are—decomposition of vegetable organic matter; a certain temperature; with a certain degree of moisture.

Without the first of these it cannot possibly arise. Very rarely are malarial diseases generated under a temperature of 60° F., and the heat must be of some duration. As this rises they become more prevalent and more severe, and hence they are very virulent in certain tropical climates. There must not be too much moisture, else the poison is absorbed by it; while it is not formed if the atmosphere is dry.

The necessary conditions as regards vegetable decomposition and moisture, are met with under the following circumstances: 1. In marshes and swamps, unless the soil is peaty or constantly overflowed with water, conditions which materially interfere with the development of malaria. 2. Where there is much vegetable matter in the soils of valleys and ravines, at the bases of mountain ranges in tropical climates, in alluvial deposits, along the banks of tropical rivers, in old estuaries, deltas of rivers, etc. 3. Where surfaces covered with much vegetation have been temporarily overflowed, so as to be left moist. 4. During the draining of lakes, ponds, etc. 5. In sandy plains containing organic matter, if there is a subsoil of clay or marl, conditions often existing simultaneously in old river courses. Also in the lower chalk formations, with a subsoil of clay or marl. 6. In certain hard granitic or trap rocks containing organic matter, such as fungi, especially if they are disintegrating. 7. In turning up the soil in the early cultivation of land, digging canals, making railways, etc. 8. Where copious vegetation has been cleared away in dense jungles for purposes of cultivation, sufficient being left behind to decompose. It frequently happens that the first result of attempts at cultivation of a new district is the production of malarial diseases, which ultimately disappear. 9. When tracts of land are from any cause allowed to fall out of cultivation, especially if the soil is rich in organic matters. 10. On board ship, where decomposing vegetable matter is mixed with bilge-water; or where malarial mud has in any way been accumulated.

The following conditions influence the development and propagation of malarial affections: 1. *Season*. Usually they are most prevalent towards the latter part of summer and in the autumn, and many malarial districts may be visited without any danger in the winter, which cannot be approached in the warm season. They are particularly liable to occur after long-continued dry and hot weather followed by warm rains. In climates where the summer is short, even though very hot, they are not prevalent. 2. *Water*. Abundance of water is a protection against malarial affections, because it absorbs the poison. Hence they are temporarily diminished by long and heavy rains and floods. Any deep sheet of water, especially running water, affords some protection, and thus the intervention of a river may prevent the poison from passing from one of its banks to the opposite one. A ship at a little distance from shore is in comparative safety. Some believe that sea-water is peculiarly protective, though it is said that

the occasional admixture of salt water increases the emanations from marshes. 3. *Winds*. These frequently convey the malaria for a considerable distance along plains, and may thus be the means of originating malarial affections in places remote from a malarial district, also counteracting the good effects of the intervention of water, etc. On the other hand, a storm may drive away the poison altogether. 4. *Low districts* are more dangerous than those which are elevated, the malaria tending to cling to the earth. By the aid of ravines and hot air, however, it may be carried up mountains to a great height, it is stated even as much as 2000 or 3000 feet. The lower rooms of houses are more dangerous than the upper. 5. *Trees*. When in large numbers these afford decided protection, both by interfering with the propagation of the poison and by keeping off the sun's rays from the soil; in some cases, however, they seem to be injurious. Certain trees are said to exert a specially protective influence, particularly the eucalyptus globulus, but this is doubtful. 6. *Mountains and hills* interfere considerably with the dissemination of malaria. 7. *Time of the day*. Morning and evening dews augment the danger from malaria materially, probably from condensing the poison. It is highly dangerous to sleep in tents at night in malarial districts. 8. *The air of cities* in some way renders the poison innocuous, for though a malarial disease may be raging outside it does not penetrate far into their interior. 9. *Artificial heat* destroys malaria, if sufficiently intense. 10. *Individual susceptibility* is increased by certain circumstances, viz., recent arrival in a malarial district; fatigue and exhaustion from any cause; exposure to the full heat of the sun; sudden changes of temperature and chills of all kinds; intemperance; exposure on an empty stomach; overfeeding; mental exhaustion or nervous depression; and overcrowding. Some persons are far more susceptible than others. Young children and old persons are least subject to malarial affections, and males are said to be more predisposed than females. White races suffer more than blacks. It is stated that the use of drinking-water from a malarial district may produce malarial diseases.

2. *Nature*.—Much doubt exists as to the nature of the malarial poison. It has been supposed to be a gas resulting from vegetable decomposition, but the most favored view is that it is organic, consisting either of microscopic plants or their spores, or of animalcules. At present, however, neither chemical nor microscopic investigation has succeeded in demonstrating the nature of malaria. It has been suggested that there are different kinds of paludal poisons, but there is no proof of this. When animal matters are mixed with the decomposing vegetable material, the poison which escapes seems to be more virulent.

3. *Mode of Entrance into the System and Effects Produced*.—The poison is chiefly inhaled and absorbed by the pulmonary membrane; it may also be taken up by the stomach, which it often seriously dis-

orders, and possibly by the skin. It acts on the nervous system, and gives rise to fevers of an intermittent and remittent type; followed after a time by permanent organic changes, especially in the liver and spleen, and also various neuralgic affections. Certain other disorders are attributed to it, such as diarrhœa, gastric derangement, palpitation of the heart, pains in the limbs and joints, amenorrhœa, as well as a general state of ill-health and a peculiar malarial cachexia, with ultimate degeperation of the race. A large number of males in certain malarial districts are said to be impotent. Dysentery and hepatic abscess are very prevalent in certain tropical malarial regions. Malaria imparts a peculiar periodicity to the affections which it originates, and once they have existed they are liable to recur on subsequent occasions independently of the action of the original exciting cause, sometimes, indeed, appearing to arise spontaneously. Various affections tend to assume a periodic character in malarial districts.

4. *Prophylaxis*.—The precautions to be taken by those who are obliged to reside in malarial districts may be gathered from what has been already stated; everything must be avoided which increases the individual tendency to malarial diseases, and every means of protection employed, so far as is possible, in arranging a place of residence, etc. It is a useful practice to give bark daily, and garlic has also been used as a preventive.

II. INTERMITTENT FEVER—AGUE.

ETIOLOGY.—Ague is the malarial fever which prevails in this country, mainly in low marshy districts. Cases are also met with here in which the complaint has originated in foreign climates. Once the disease has been excited, subsequent attacks may arise without any exposure to malarial influence.

ANATOMICAL CHARACTERS.—The spleen presents the most notable changes, being at an early period much enlarged from congestion, softened, and sometimes pulpy. After awhile it becomes permanently hypertrophied and firm, constituting the so-called "ague-cake." The liver is also congested and soft, and ultimately hypertrophied; albuminoid disease of this organ has been stated to be produced occasionally. The stomach and duodenum are often congested, and their mucous membrane softened; in some cases ulcers have been observed. In rapidly fatal cases the heart is softened, and its tissue undergoes degeneration. Chronic Bright's disease is believed to be set up sometimes by ague. In persons who have resided for a long period in malarial districts, black pigment is often found in the spleen, liver, and kidneys. The blood is unhealthy and may contain black pigment.

SYMPTOMS.—Ague consists of paroxysms of fever, running through certain definite stages, occurring at more or less regular intervals, with intermediate periods of complete apyrexia.

The *invasion* is generally indicated by the ordinary symptoms premonitory of fever, which are noticed for some days before the disease declares itself, the pyrexia presenting well-marked remissions, with a periodic tendency. Sometimes the attack is sudden.

A *paroxysm* or *fit* of ague consists of three distinct successive stages, named respectively the *cold*, the *hot*, and the *sweating* stage.

1. *Cold Stage*.—Ordinarily a fit is preceded by general uneasiness and languor, inaptitude for any exertion, headache, and loss of appetite. Soon the patient feels cold, first in the limbs, then along the back and over the body. The teeth begin to chatter, and finally the entire frame shivers. At the same time the general surface of the skin appears pale and shrunken, especially that of the face, the features being pinched and sharp. The tips of the fingers and lips look blue, and in severe cases the whole surface assumes a purplish hue. *Cutis anserina* is frequently observed. The patient often complains of pains in the back and limbs, and headache. The tongue is usually pale, moist, clean, and cool; appetite is lost, but thirst is a frequent symptom. Nausea and vomiting are not uncommon, with uneasiness and sense of weight in the epigastrium. There is a sense of dyspnoea, with hurried breathing, and often a dry cough, the expired air being cool. The pulse is usually frequent and small, and may be irregular.

The intensity of this stage varies greatly. There may be signs of serious depression or collapse, with a tendency to stupor or coma. Its duration ranges from a few minutes to three, four, or five hours.

2. *Hot Stage*.—The transition to this stage may be sudden, but is generally gradual, there being alternate flushings and chilliness, or parts of the body becoming warm. When fully developed the skin feels burningly hot and dry, is red and tumid, and sometimes a patchy rash appears. The face is flushed, and the eyes are injected and sparkling. There is intense thirst, with dryness and heat of mouth, total anorexia, a white tongue, and sometimes nausea or vomiting. The heart and great arteries throb, and the pulse is generally strong and full. Respiration is more quiet than in the first stage. Headache is always present, with a sense of throbbing, and sometimes more or less delirium, which may be very violent, or convulsions.

This stage lasts usually from three to eight hours, the extremes being from two to eighteen hours.

3. *Sweating Stage*.—Perspiration breaks out first about the forehead, and then by degrees over the body. Its amount varies, but it is generally considerable, so that the bed-clothes are saturated, and sometimes even the bedding. In cases originating in certain malarial districts, the perspiration is said to have a peculiar sickly and most disagreeable odor. It continues to flow for some time, during which the pyrexia becomes reduced and the symptoms rapidly abate; the patient usually soon falls asleep, and awakes well or comparatively well. Along with

the sweating there is a critical urinary discharge, and not unfrequently diarrhoea. Anasarca has been observed when sweating is deficient.

Intermission.—At first a person suffering from ague may feel quite convalescent during the periods intervening between the paroxysms, but soon more or less languor and depression is experienced, with neuralgic pains and loss of appetite, while the patient becomes pale and anæmic. After awhile permanent organic mischief is established, especially in connection with the spleen, attended with serious symptoms, which will be described when treating of splenic diseases.

Temperature.—The course of temperature in ague is quite characteristic, the paroxysm being marked by a rapid ascent, short and intense stationary period, and critical defervescence, the temperature in the intervals being perfectly normal. There is a rise as soon as, or even before, the cold stage begins; at first it is only slight and gradual, but soon becomes rapid, continuing during the hot stage and sometimes into the commencement of the sweating stage. The temperature generally runs up to 105° or 107° , but may reach 108° , 110° , or even 112° in hot climates.

When sweating begins there is generally a slight alternate rise and fall at first, but soon a steady fall sets in, of 2° or more every five to fifteen minutes, until the temperature becomes normal. It is important to notice that even before the paroxysms are experienced, and after they have apparently ceased, the temperature has been observed to rise at the usual periods.

Urine.—During the cold and hot stages water is increased, but it diminishes at the close of the latter, and is very deficient while sweating is going on, so that the specific gravity rises. Urea suddenly increases in amount as soon as the rise in temperature begins, and this continues until the sweating stage sets in, when it rapidly or gradually diminishes, often falling below the normal. A relation is said to exist between the amount of urea discharged and the temperature. Uric acid is also considerably in excess, and urates are generally deposited at the close of the fit. Chloride of sodium is greatly increased, while phosphates are much diminished. Albumen, blood, or casts are not unfrequently present in the urine. In the intervals the state of the urine varies much. It is not uncommonly alkaline. Urea is deficient as a rule.

TYPES AND VARIETIES.—The chief types of intermittent fever are those founded upon the length of the interval between the paroxysms, viz.: 1. *Quotidian*, in which there is a daily paroxysm, with an interval of twenty-four hours. 2. *Tertian*, where a fit occurs every other day, the interval being forty-eight hours. 3. *Quartan*, a paroxysm taking place every third day, the interval being seventy-two hours. These are the usual types, but exceptionally the following are met with: 4. *Double quotidian*. 5. *Double tertian*, a seizure occurring every day,

but at different hours or with different characters. 6. *Double quartan*, out of three days two having each a paroxysm, the third none. 7. *Duplicated tertian*, there being two paroxysms one day, none the next. 8. *Erratic or irregular*. Other very rare types are described.

The *quotidian*, which is the most common, has the longest paroxysm; this is said to occur earlier in the day, and to have the shortest cold stage, but the longest hot stage. In the *quartan* variety, which is the least common, the conditions are just the opposite; the *tertian* being intermediate. Sometimes the fits tend to begin earlier or later each day, and thus ultimately one type may be changed into another, or the change may take place suddenly.

A paroxysm may present certain peculiarities. Occasionally one or more of the stages may be wanting. The phenomena are in rare instances limited to certain parts of the body; thus in paralyzed patients they may be confined to the non-paralyzed parts.

Certain forms of ague are also described depending upon the symptoms present, viz.: 1. *Sthenic*. 2. *Asthenic*. 3. *Pernicious* or *malignant*, the last approaching the remittent type, and only occurring in hot climates, being attended with delirium, coma, or an algeid condition.

COMPLICATIONS AND SEQUELÆ.—Persons suffering under the influence of malaria are very liable to pneumonia, which comes on rapidly, often involves both lungs, and is of a very dangerous character. This is particularly observed in patients returning from hot malarial climates to cold climates. The blood is also prone to undergo acute changes of a serious character, ending in marked anæmia with excessive formation of white corpuscles, this condition being accompanied with dropsy. Various neuralgiæ are apt to follow ague.

PROGNOSIS.—Intermittent fever is not often directly fatal in this country. Some of its varieties are exceedingly grave, especially those classed as *pernicious*. The complications mentioned above are also very serious. If treatment has been long delayed, so that the malarial cachexia has become established, it is difficult to bring about a complete cure. The quartan type of ague is the most obstinate form to be got rid of. It must be remembered that those who have suffered from this disease are liable to future attacks, apart from any exposure to malarial influence.

TREATMENT.—1. *During the Paroxysm*.—In the *cold stage* the patient should remain in bed well covered with blankets, some form of dry heat being applied externally, and hot drinks administered. In this country nothing further is necessary as a rule. When there is much depression, diffusible stimulants are required, and a little opium may be given to relieve great restlessness. Persistent vomiting is best checked by giving an emetic of sulphate of zinc, with plenty of warm water. If this stage is greatly prolonged a hot-air bath may be employed. In the *hot stage* the skin should be sponged freely, and cooling effervescent or saline drinks be given. During the *sweating stage* nothing is necessary but to keep the patient covered, so as to prevent a chill.

2. *During the Intervals.*—The great remedy at this time is *quinine*, and it rarely fails to bring about a speedy cure. There is much difference of opinion as to the mode in which it should be administered. By some it is recommended to give one large dose of twenty to thirty grains, either before or at the close of the paroxysm. In a large number of cases which came under my treatment at the Liverpool Northern Hospital, I found most satisfactory results from the administration of three or four grain doses every four or six hours during the intermission, and therefore am disposed to adhere to this practice. In some cases it is said the stomach rejects quinine, and then it may be combined with a little opium, or administered by enema. The subcutaneous injection of the neutral sulphate of quinine has also been advocated. It is important to notice that the remedy must be continued for some time after the paroxysms have apparently ceased, *i. e.*, until the temperature has become quite normal. Various substances have been employed as substitutes for quinine. Of these the only reliable remedies are cinchona bark, cinchonine, and arsenic. The last is decidedly beneficial, and has the advantage of being cheap. It is best given in the form of Fowler's solution, beginning with four or five minims three times a day. The alkaline sulphites have been recommended.

Symptoms and complications may arise requiring special attention. They must on no account be permitted to interfere with the use of quinine. Possibly venesection may be indicated, but I have never met with a case necessitating it in this country. Adynamic symptoms must be treated by external and internal stimulation.

For the cachexia induced by ague, as well as the different neuralgic affections, quinine, iron, and arsenic, constitute the most reliable remedies, and they may be advantageously combined. Phosphorus may also be found serviceable. The tincture of eucalyptus globulus has been highly extolled. Patients should immediately be sent from a malarial region to some suitable climate, care being taken to attend to all hygienic conditions, to give good food, and to see that the clothing is warm; especially if they have to undergo a change from a hot to a cold climate. Various mineral waters and baths may be useful, such as Carlsbad and Friedrichshall waters, and warm baths or Turkish baths.

The *preventive* treatment is that for malaria in general, and, if possible, residence in a malarial district should be immediately discontinued.

III. REMITTENT FEVER.

ETIOLOGY.—The malarial fevers of hot climates often assume a remittent type, there being irregular exacerbations and remissions, the latter being less distinct if the fever is very intense. They vary much in their severity, and have received many local names.

There is no distinct limit between this class of fevers and those of an

intermittent type, both being due to the same cause, but this is aided by a high temperature in originating remittent fever. One type sometimes changes into the other.

SYMPTOMS.—There are generally premonitory signs, but the attack may be sudden. Gastric irritation is usually first noticed, there being uneasiness or oppression at the epigastrium, nausea, anorexia, with headache, general pains, and a feeling of languor. There may be some chilliness or rigors, but there is no *cold stage* of any duration, and the temperature rises immediately. The *hot stage* becomes very intense, the skin being burning and dry, the face flushed, the eyes injected, with intense headache, giddiness, restlessness, sleeplessness, and often delirium, which is sometimes violent. Vomiting and nausea are commonly present, the vomited matters consisting first of food, then of watery fluid, and finally of biliary matters. They may become brown or black. There is great oppression and weight in the epigastrium, with a furred tongue tending to dryness, parched lips, and intense thirst. The pulse is frequent, either full, or small and compressible.

The symptoms abate generally in from six to twelve hours, but may continue for twenty-four, thirty-six, forty-eight hours, or even longer. Some perspiration usually breaks out as improvement takes place.

The remission is of variable duration, and then an exacerbation sets in, of greater intensity than the first attack. The time and number of remissions differ in different cases. When the disease is established, there is almost invariably a morning remission. The exacerbation may begin at noon, declining towards midnight; or it may begin at midnight and last till morning. In severe cases there may be a double exacerbation, viz., at noon and midnight.

As the case progresses signs of intense adynamia may set in. Yellowness of the skin is common, and hæmorrhages sometimes occur: these symptoms associated with "black vomit" make a case of remittent fever to resemble specific yellow fever. Occasionally marked jaundice is observed. The spleen and liver are usually enlarged and tender. The urine is generally stated to be scanty, dark, and of high specific gravity. In India, Dr. Maclean has noticed just the opposite characters. It is always acid and rarely albuminous. Urea is increased and uric acid diminished until convalescence is established.

The entire duration is from five to fourteen days usually. The terminations are in death from blood poisoning or exhaustion; in recovery, usually ushered in by free perspiration, but sometimes taking place gradually; or by transition into an intermittent fever.

TREATMENT.—It is important to attend to hygienic conditions, and to have good ventilation. During the hot paroxysm cool drinks should be given freely, and, if necessary, cold applied to the head. External application of cold, by one of the methods recommended for hyperpyrexia, is most valuable. Vomiting must be checked by the usual remo-

dies. As soon as the remission occurs *quinine* must be given in ten, fifteen, or twenty grain doses every two hours; if the stomach rejects it, enemata must be employed. This remedy is to be administered until the system has become saturated with it, and signs of "cinchonism" are evident. It is also to be used should any complications arise. A compound named Warburg's tincture has gained much repute in the treatment of remittent fevers.

All antiphlogistic remedies are to be deprecated, as well as the use of calomel, except as an aperient. It is desirable to keep the bowels well opened. Bland nourishing diet is necessary, and often stimulants are required in considerable quantities.

CHAPTER XXVII.

ON THE DIAGNOSIS OF ACUTE SPECIFIC DISEASES.

FOR several reasons it has seemed to me advantageous to treat of the diagnosis of acute specific diseases in a connected manner, and to devote a special chapter to the consideration of the subject. Obviously it is of great moment in ordinary practice that an accurate diagnosis of either of these affections should be arrived at as speedily and promptly as possible, and in the large majority of cases any one possessing the requisite knowledge of their characters may come to a positive conclusion on this matter without hesitation or delay. At the same time it is always important to avoid carelessness or undue haste in forming an opinion. Not a few cases come under observation, more especially those of a febrile character, in which it is impossible at the outset to arrive at any certain conclusion as to their nature, and under such circumstances it is better to postpone the diagnosis for a shorter or longer period, watching the progress of events, and observing the phenomena which present themselves. In some doubtful cases it may be allowable and even desirable to give an opinion as to the probable nature of the disease, but it is a great mistake to venture upon any definite and dogmatic diagnosis on insufficient data.

Several of the acute specific disorders present such characteristic symptoms, that once these are fully pronounced there is no difficulty in recognizing them. Others, however, are not so clearly marked off, and careful consideration may be necessary in order to discriminate them. I proceed therefore to point out briefly what are the chief facts which have to be known and taken into account in order to form an opinion as to the diagnosis of these complaints.

1. The diagnosis is materially assisted by a correct acquaintance with

the etiology of each acute specific disease, and by the information elicited in connection therewith in any individual case. It is important to remember which of them are infectious, and which are constantly or may be exceptionally originated in other ways; the modes in which the contagium is conveyed in each disease, and the channels by which it enters the system; the conditions, both intrinsic to the individual and extrinsic, which affect its propagation; the period of incubation; and the effect upon the patient of previous attacks, whether these afford probable security from future attacks, or increase the predisposition to them.

The early recognition of a particular acute specific disease may be much aided by the fact that an epidemic is prevalent at the time; or by direct evidence that the patient has been exposed to infection in some way; or has been under the influence of some other well-known cause, such as malaria. It not uncommonly happens, however, that very careful inquiry is necessary in order to trace infection, as, for instance, in the case of typhoid fever and scarlatina; the contagium too may be so obscurely conveyed by fomites, that it may be most difficult or impossible to track it to its origin; while it must be borne in mind that some diseases which are ordinarily transmitted by infection, such as typhus and relapsing fever, may probably be generated *de novo* under certain circumstances. Hence even if a source of contagion cannot be discovered, it does not necessarily exclude a specific disease which may be suspected to be present. As an illustration of the value of remembering the conditions which influence the occurrence of acute specific diseases, may be mentioned the effect of age and hygienic conditions with regard to typhoid and typhus fever respectively. Most of these complaints are as a rule only observed once in the same individual, and hence in the case of any suspected fever, it is well at the outset to find out what affections of this class the patient has previously suffered from, so that these may be excluded by probability. At the same time the fact must be recognized that second and even third attacks of the eruptive fevers do sometimes occur; while certain of the acute specifics, such as erysipelas, are predisposed to by previous attacks, and this may help in fixing upon or at least suspecting one of these before the clinical phenomena are at all significant.

2. Obviously it is essential to have a complete and correct acquaintance with the clinical history of each of the affections now under consideration, before a diagnosis can be made with any degree of certainty. This includes:

- a. Its mode of invasion.
- b. Its more characteristic symptoms, particular attention being paid to those which are presented at an early period.
- c. The chief facts connected with the skin-eruption, in the case of those diseases which are attended with such a phenomenon.

d. The degree of pyrexia, and course of temperature as indicated by the thermometer, when this is at all significant.

e. Its ordinary course, duration, modes of termination, and mortality.

f. The varieties it may assume, so as to be prepared for any deviation from the usual type.

g. Its ordinary complications and sequelæ. A knowledge of these is useful in several ways in a diagnostic point of view. Thus it may guard the practitioner against mistaking some local mischief which he may have discovered, *e. g.*, pneumonia, for the entire disease, when it is but a complication of some fever; it enables him further to be on the lookout for such morbid conditions as are liable to arise in the course of or after any particular fever; while the development of a certain special complication or sequela may throw much light upon the nature of an otherwise obscure case.

3. Diagnosis of the specific fevers more especially, is greatly aided and facilitated by a clear understanding of the complaints which they severally resemble and are likely to be confounded with. In the first place it is requisite to bear in mind with regard to each of them, which diseases of its own class approach it in its characters, and are liable to be mistaken for it; and, secondly, other febrile diseases which are more or less like it, whether dependent upon local mischief, or due to some deleterious agent in the system, such as rheumatic fever, pyæmia, etc.

It would only involve unnecessary repetition to recapitulate the points just indicated with reference to each acute specific disease, as they have been already considered in detail, and my main object in this chapter has been to sketch the kind of information required, and to suggest the line of reasoning to be adopted in order to form a diagnosis of individual cases of these complaints. I propose, however, first to make a few remarks respecting febricula; then to present in the form of a table the chief clinical features of the principal fevers prevalent in this country, and the diseases for which they are liable to be mistaken; and lastly, to notice briefly each of the more peculiar or less common specific affections.

FEBRICULA.—The occurrence of a sharp febrile attack, unattended with phenomena characteristic of any other fever, and not dependent upon any discoverable local lesion, may be looked upon as indicative of febricula or synocha. The rapid rise of temperature is important, especially in distinguishing this complaint from typhoid fever. At the outset of course it is often impossible to say what may be the nature of the case; and there can be no doubt but that many cases of so-called febricula are really cases of pyrexia associated with some local morbid condition which has not been detected. The opinion has been advanced that under this term are included more than one form of specific fever, perhaps several, but the present state of knowledge certainly does not warrant any such assumption.

DIAGNOSTIC TABLE OF THE PRINCIPAL FEVERS.

MODE OF INVASION.	TYPHOID FEVER.	TYPHUS FEVER.	RELAPSING FEVER.	SCARLATINA.	MEASLES.	SMALL-POX.	VARICELLA.	ERYSIPELAS.
Often very gradual and ill-defined Patient cannot fix date. No marked rigors. May be only diarrhoea for some time.	Generally well-marked and may be very sudden. Usually marked rigors. Specdy prostration and high fever.	Generally remarks: Sudden, severe rigors. Great weakness.	Usually distinct—Chilliness, but not severe rigors. Rapid pyrexia. May be nervous phenomena, such as convulsions or coma.	Moderate pyrexia. Catarrhal phenomena, viz., coryza, epistaxis, sore throat, if any. More or less catarrh of respiratory passages, extending to bronchi, and increasing during eruptive stage. May be much diarrhoea and vomiting.	Rather sudden, and generally marked. Chills, or rigors. Occasionally convulsions.	Generally sudden. Often repeated and strong rigors. Rapid pyrexia.	Not marked.	Often gradual, with indefinite febrile symptoms.
Marked frontal headache, but other head symptoms not prominent, or only come on at a late period. Abdominal symptoms late, pain and tenderness especially in right iliac fossa; rigors, typhus, diarrhoea, rigors, tendency to hypotension in right iliac region; diarrhoea with peculiar stools; not uncommonly intestinal hemorrhage. Enlarged spleen. No particular prostration. Epistaxis not uncommon—Tongue peculiar at first. Pulse liable to great variations.	Great depression and prostration. Dinky head symptoms and mummy aspect of countenance. Pain in epigastrium and hypochondria. Biliousness on cheeks, and thus heavy expression. Early and marked head symptoms and low nervous prostration. Rigors, typhus, diarrhoea, rigors, tendency to hypotension in right iliac region; diarrhoea with peculiar stools; not uncommonly intestinal hemorrhage. Enlarged spleen. No particular prostration. Epistaxis not uncommon—Tongue peculiar at first. Pulse liable to great variations.	Sharp frontal headache. Severe pains in back and limbs. Pains in epigastrium and hypochondria. Biliousness on cheeks, and thus heavy expression. Early and marked head symptoms and low nervous prostration. Rigors, typhus, diarrhoea, rigors, tendency to hypotension in right iliac region; diarrhoea with peculiar stools; not uncommonly intestinal hemorrhage. Enlarged spleen. No particular prostration. Epistaxis not uncommon—Tongue peculiar at first. Pulse liable to great variations.	High pyrexia—Flushed face. Sore throat of variable intensity, but always marked. Vomiting. "Strawberry tongue." No prominent head symptoms usually. Pulse very frequent, and generally strong and full.	Moderate pyrexia. Catarrhal phenomena, viz., coryza, epistaxis, sore throat, if any. More or less catarrh of respiratory passages, extending to bronchi, and increasing during eruptive stage. May be much diarrhoea and vomiting.	Rather sudden, and generally marked. Chills, or rigors. Occasionally convulsions.	Generally sudden. Often repeated and strong rigors. Rapid pyrexia.	Not marked.	Often gradual, with indefinite febrile symptoms.
7th to 12th day; generally confined to abdomen, chest, and back; comes on in successive crops, spreading rapidly over the body and each lasting 3 to 5	4th or 5th day usually; first, about back of wrist, axilla, or epigastrium, unimpaired rapidly over the body and	No specific eruption. Sudamina may appear on neck and upper part of the chest; spreads rapidly to face and over trunk and limbs; consists	4th day usually; first on face, especially on forehead; spreads to trunk and limbs; often in three dis-	4th day generally, 3d or beginning of 4th day; first on face, especially on forehead; spreads to trunk and limbs; often in three dis-	4th day generally, 3d or beginning of 4th day; first on face, especially on forehead; spreads to trunk and limbs; often in three dis-	4th day generally, 3d or beginning of 4th day; first on face, especially on forehead; spreads to trunk and limbs; often in three dis-	4th day generally, 3d or beginning of 4th day; first on face, especially on forehead; spreads to trunk and limbs; often in three dis-	4th day generally, 3d or beginning of 4th day; first on face, especially on forehead; spreads to trunk and limbs; often in three dis-

CHARACTERISTIC SYMPTOMS.

ERUPTION.

<p>days; consists of minute rose-colored spots slightly raised, disappearing on pressure; only a few visible at same time; continue to appear until 28th or 30th day, or even later. Sudamina not uncommon.</p>	<p>of rash, beginning as minute points coalescing to form patches or to cover entire surface; color more or less bright red; no elevation generally; reaches height 4th to 5th day, then gradually fades to 9th or 10th day; followed by marked desquamation; often puffiness of face, etc.; much itching and tingling, with burning sensation. Sudamina common.</p>	<p>tingent crops on successive days; consists of minute red points at outset, soon enlarging to distinct papules, which tend to form crescentic or semilunar patches; color darker than for that of scarlatina; declines in same order in about 12 hours; followed by slight desquamation; reddish or coppery discoloration may remain for some time; much itching.</p>	<p>often in successive crops; consists of "pock" going through stages of a. small bright red spot; b. hard, shot-like pimple; c. vesicle, becoming umbilicated; d. pustule reaching maturity about 8th day; e. scab, which leaves reddish brown stain on separation, or pits. Hard inflamed areola forms. Very variable mode of arrangement and number. Swelling of face, etc. Intense itching. Disagreeable odor given off. Eruption may be on mucous surfaces.</p>	<p>scalp, but generally few on face; comes out in successive crops for 4 or 5 nights; first bright red, slightly painful spots, not hard; in few hours vesicles or bullae, which rupture or dry up; subsequeent extensive peeling of cuticle; may end in inflamed areola; do not become pustular, but gradually opalescent and dry up or rupture 3d to 5th day; usually few in number and scattered; as a rule no pitting left.</p>	<p>No special course. Pyrexia usually slight; may be marked rise of temp. in the evening.</p>	<p>Very variable course according to part affected; in facial eruption, rapid rise of temp. When local inflammation appears may reach 104° or 105° on first evening; increases so long as inflammation extends, but usually reaches maximum on 3d day; may be 106°—108°; generally evening exacerbations, but may be distinct fall; deferrescence usually about 5th or 6th day of inflammation; as a rule by rapid crisis; temp.</p>
<p>Peculiar ascent; rise of 2° each evening, with morning remission of 1° there-fore daily rise of 1°; temp. finally reaches to from 104° to 106° in evening; usually, with slight morning remission; decline gradual, indicated by more distinct morning remission, varying from 6-10° evening fall, with very considerable morning remission; some time before evening temp. normal.</p>	<p>Continuous ascent for 4 or 5 days; temp. at last reaches 104° to 105°; morning remissions; rapid fall at night, with subsequent speedy rise to former temp. or even higher; sud-defervescence again at second crisis.</p>	<p>Continuous ascent until rash attains height; generally reaches 104° to 106°; may be 108° or higher; slight morning remission; defervescence may be by crisis, or gradual when eruption begins to fade.</p>	<p>Continuous ascent up to height of rash; temp. not usually above 103°; morning remissions slight, marked, or absent; defervescence by rapid crisis, from 4th to 10th day; temp. liable to be much influenced by complications.</p>	<p>Rapid rise of temperature to 104°—106°; speedy fall, nearly or quite to normal, when eruption appears; rises again as the eruption matures, and varies with the amount of this; temp. reaches 104° or 105° in a typical case; gradual defervescence; may be another elevation of temperature when desiccation occurs.</p>	<p>No special course. Pyrexia usually slight; may be marked rise of temp. in the evening.</p>	<p>Very variable course according to part affected; in facial eruption, rapid rise of temp. When local inflammation appears may reach 104° or 105° on first evening; increases so long as inflammation extends, but usually reaches maximum on 3d day; may be 106°—108°; generally evening exacerbations, but may be distinct fall; deferrescence usually about 5th or 6th day of inflammation; as a rule by rapid crisis; temp.</p>

DISEASE OF PYREXIA
AND COURSE OF TEMPERATURE

DIAGNOSTIC TABLE OF THE PRINCIPAL FEVERS—Continued.

TYPHOID FEVER.	TYPHUS FEVER.	RELAPSING FEVER.	SCARLATINA.	MEASLES.	SMALL-POX.	VARICELLA.	ERYSIPELAS.
Continuous. Duration usually from 3 to 4 weeks; rarely beyond 30 days. Most cases end in recovery. No crisis, but deferrescence gradual. Convalescence slow, and health liable to remain permanently impaired. Relapses not uncommon.	Continuous. Duration usually from 14 to 21 days. Most cases recover, but mortality varies in different epidemics. Generally marked by deep sleep and rapid improvement in symptoms. Convalescence is usually comparatively speedy. Relapses exceedingly rare.	Peculiar course viz. sudden crisis usually from 5th to 7th day, attended with profuse sweating, and other phenomena, followed by complete or partial cessation of symptoms; from 12th to 15th day sudden relapse, with same symptoms as at first; second crisis generally in from 3 to 5 days; may be a series of relapses. Duration variable. Almost always recovery, but convalescence often very slow, with debility, anemia, muscular and arthritic pains, etc.	Continuous. Duration often prolonged on account of desquamation. Mortality very variable, but often high. Convalescence liable to be retarded by various sequelae, especially renal disease, with albuminuria and dropsy. Very rarely relapse.	Continuous. Duration usually within a fortnight. Most cases recover. Termination generally by rapid crisis. Very rarely relapse.	Course and duration very variable. Termination fatal in large proportion of cases, about 1 in 3. Recovery is gradual, and convalescence often much delayed.	Short duration. Never fatal. Generally speedy recovery.	Variable duration. Termination not uncommonly fatal. When favorable, usually marked crisis. Convalescence established in variable time.
<div> <div>Typhoid fever. Relapsing fever. Measles at early period. Erysipelas. Febricula.</div> <div>Typhus fever. Relapsing fever. Febricula.</div> </div>	Typhoid fever. Relapsing fever. Measles at early period. Erysipelas. Febricula.	Typhus fever. Typhoid fever.	Measles. Erythema. Smallpox. Diphtheria. Smallpox in the invasion stage.	Scarlatina. Erythema. Smallpox (at early stage of eruption). Typhus fever. Invasion stage (in the invasion stage).	Febricula. Varicella. Measles (in early stage of eruption).	Small-pox.	Typhus fever.

COURSE, DURATION, AND TERMINATIONS.

RESEMBLING.

DISEASES.	Other diseases.	Acute tuberculo- culosis. Tubercu- lar meningi- tis. Pneumonia. Pyemia. Renal disease with uremia. Gastro- enteritis. Chro- nic peritonitis, with ulceration of the bowels.	Athensic pneumo- rheumatic fever.— Gastric or hepatic affections.	Acute throat in- flammations. Ro- seola. Urticaria. Erythema. A rash like that of scarla- tina is sometimes seen in surgical cases.	Roseola. Syphilitic exanthem. Flea- bitica.	Lichen (at early pe- riod). Pustular- phillitic eruption.	Acute eczema. Ery- thema.
REMARKS.	Cases of typhoid fe- ver are liable to be very obscure, and present consider- able differences in their clinical his- tory; care is there- fore necessary in diagnosis. When there is persistent diarrhea, always bear in mind ty- phoid fever, and use the thermome- ter. Patients may walk about during the entire attack. The most impor- tant complications are perforation of the bowels and pe- ritonitis. More or less bronchial ca- tarrh is always pre- sent.	Typhus fever can be generally recogniz- ed without much difficulty. It differs from typhoid not only in the points indicated in the ta- ble, but also in fre- quently attacking persons beyond middle life, and be- ing much influ- enced by unfavor- able hygienic con- ditions, which pro- bably may even originate the dis- ease <i>de novo</i> . There is a great liability to hypostatic con- gestion.	Relapsing fever is most liable to be mistaken for ty- phus at first, but the differences in- dicat-d above, ought to enable the diagnosers to be made. The two dis- eases are promoted by the same anti- hygienic condi- tions. Among the most distinctive complications are abortion and a pe- culiar form of oph- thalmia.	Scarlatina presents without its erup- tion, or without its catarrhal symp- toms. There are also malignant va- rieties, difficult to recognize. The di- agnosis of r6theln has been suffi- ciently indicated in the account of that disease, and need not be further con- sidered in this table.	Measles may occur without its erup- tion, or without its catarrhal symp- toms. There are also malignant va- rieties, difficult to recognize. The di- agnosis of r6theln has been suffi- ciently indicated in the account of that disease, and need not be further con- sidered in this table.	Small-pox presents many varieties, es- pecially as regards the eruption, and this is greatly mo- dified by vaccina- tion; it is even believed that there may be no erup- tion; malignant forms of the dis- ease are also met with. Hence diag- nosis may be diffi- cult. The greatest difficulty lies in dis- tinguishing mild cases from those of chicken-pox.	Cases of erysipelas are often very diffi- cult to recognize at the outset. It might be suspected if there were febrile symptoms, without any of the pre- monitory signs of other fevers, or any symptoms pointing to local disease, es- pecially if accom- panied with un- usual and sub- jective sensations about the face or other parts; or if lymphatic glands seem to be inflam- ed. The fact of a patient having had previous attacks may help in fore- telling a coming one.

REMARKS.

DIPHTHERIA.—The general symptoms, local throat symptoms, with satisfactory examination of the throat, will in most cases enable this disease to be recognized. It may at first be mistaken for any acute sore throat, or for scarlatina, extensive thrush, or herpes on the pharynx. In the last mentioned vesicles may be seen, which cannot be removed; the pain is much more severe, but limited, and herpes is visible on the lips. When it involves the larynx, diphtheria resembles croup, which indeed has been considered a form of diphtheria. Some asthenic cases may be difficult to recognize at first.

INFLUENZA is sufficiently characterized by its epidemic character, marked febrile symptoms, with great depression, and catarrhal phenomena. It might be confounded with simple catarrh.

HOOPING-COUGH.—In the early stage this complaint cannot be diagnosed with certainty, but it might be suspected if the disease is epidemic, if the cough is of a violent spasmodic character, and if there is much pyrexia. Subsequently the peculiar fits of cough with expectoration are absolutely distinctive.

MUMPS.—This affection is also very easily recognized as soon as the peculiar inflammation of the parotid gland sets in, running its special course. It might be mistaken for inflamed lymphatic glands in the neighborhood. The metastatic inflammations which are liable to arise must be borne in mind.

GLANDERS—FARCY—MALIGNANT PUSTULE.—When these diseases are fully declared, their diagnosis presents no difficulty. At the outset glanders may be mistaken for acute or subacute rheumatism, but the occupation of the patient might lead to the suspicion of glanders; while in this affection there is more prostration from the first, and the joints are not swollen or red.

HYDROPHOBIA is another quite peculiar disease, the symptoms of which are highly characteristic. The chief liability to error lies in the fact that a patient who has been bitten by a supposed mad dog may be imagining all kinds of symptoms simulating those of hydrophobia, especially if nervous or hysterical.

CHOLERA.—During an epidemic of cholera, it is the safest plan to treat any case presenting its characters as being of this nature. The painless purging and vomiting, with "rice-water" stools, cramps, intense thirst, great restlessness, suppression of secretions, rapid collapse, and peculiar appearance of face, are but too significant of the malady. A sporadic case often presents much difficulty, and it may be impossible to determine whether it is one of true cholera or not. Usually some cause may be found for the attack; it is less severe; the stools and vomited matters contain bile; more or less griping is felt; urine is not entirely suppressed; the duration is longer; and the mortality is much less. Cholera may set in so violently and under such circumstances as to simulate irritant poisoning; on the other hand, intense gastro-enter-

itis due to poison or some other cause has been mistaken for cholera, and so has the collapsed condition resulting from a rupture of a gastric or duodenal ulcer.

CEREBRO-SPINAL FEVER is another very well-marked disease, characterized by the circumstances under which it arises: its sudden onset, high fever, and symptoms indicative of grave cerebro-spinal meningitis. The appearance of herpes or purpuric spots and hæmorrhages may also assist the diagnosis. The complaint might be mistaken at first for typhus, typhoid, or relapsing fever, and subsequently for tetanus, but there is more danger of its being confounded with other forms of meningitis.

DENGUE—PLAGUE—YELLOW FEVER—REMITTENT FEVER.—These diseases of foreign climates need but little special notice. The symptoms of dengue and plague have already been sufficiently described. Yellow fever and malarial remittent fever may resemble each other, both being frequently attended with a yellow skin and black vomit. The points of distinction are said to be as follows: Yellow fever is contagious, has only one paroxysm, and is not periodic; a second attack is very rare; it cannot prevail at a temperature at which malarial fevers are often met with; hæmorrhages and albuminuria are very common, the latter being almost invariable; quinine has not the influence over the disease which it has in the case of malarial fever. Relapsing fever might possibly be mistaken for yellow fever, but it differs in its course; in attacking chiefly the poor and destitute; in the rarity of black vomit, and comparative infrequency of jaundice; and in being scarcely ever fatal.

INTERMITTENT FEVER in this country is almost always readily recognized by its peculiar paroxysmal febrile attacks and course of temperature. Some difficulty might be experienced at first in distinguishing a case where there was no history of malarial exposure, which is not always easy to trace, but all doubt ought to be removed by watching the patient for a day or two. Cases of malarial cachexia might afford some difficulty in diagnosis.

B. CONSTITUTIONAL DISEASES.

CHAPTER XXVIII.

RHEUMATISM.

THIS term is applied to very different diseases; for convenience sake it will be expedient to treat of them all in the present chapter.

1. ACUTE ARTICULAR RHEUMATISM—RHEUMATIC FEVER.

ETIOLOGY.—The immediate pathological cause of rheumatic fever is the presence in the blood of a poisonous material, generated within the system by some derangement of the nutritive and eliminatory processes. This is generally presumed to be a normal ingredient of one of the ordinary excretions, only present in excess, the common belief being that it is lactic acid. The results of experiments seem to favor this view, the usual phenomena of rheumatism having been produced by injecting this substance into serous cavities.

Exciting Causes.—The ordinary exciting cause is a sudden chill, induced by exposure to cold and wet; sitting in a draught when heated or perspiring; neglecting to change wet clothes, etc. In not a few instances no definite cause can be fixed upon, and it is quite conceivable that processes may go on gradually in the system which tend to generate an amount of the poison sufficient to produce the complaint. Errors in diet, suppression of menses, and other disturbances, have been ranked as causes. Scarlatina seems to lead to rheumatism sometimes, probably by interfering with excretion.

Predisposing Causes.—Acute rheumatism is distinctly a hereditary disease. It chiefly attacks persons from fifteen to thirty-five, but especially from sixteen to twenty years of age, but no age is exempt. Previous attacks decidedly increase the predisposition. More cases are met with among males, and in the lower classes, on account of greater exposure to the exciting causes. Climate and season have considerable influence, the affection occurring mainly in temperate but very moist climates, and where there are sudden changes in temperature. It is far less common in tropical and very cold countries. A large number of cases are observed in the eastern counties of England. The same conditions influence the prevalence of the complaint at different seasons. A state of ill-health from any cause is said to predispose to rheumatic fever, and also mental depression or anxiety; but many individuals are attacked when in apparently perfect health. Joints which are much used, or which have been injured, are particularly liable to become affected.

ANATOMICAL CHARACTERS.—The morbid changes associated with acute rheumatism are chiefly evident in fibrous, fibro-serous, or synovial structures. A variable number of the joints present signs of acute inflammation. The synovial membrane is very vascular, thickened, and relaxed; there may be a deposit of more or less lymph, and the joint contains a moderate quantity of fluid effusion, chiefly serous, but having flakes of fibrin and cells floating in it, the latter often resembling pus-cells. The tissues around the joint are much infiltrated with fluid. In cases of long duration pus may form, and the cartilages sometimes become eroded. The sheaths of tendons may be inflamed,

and occasionally contain a purulent fluid. The muscles are often dark, soft, and infiltrated.

In the majority of cases the morbid appearances characteristic of pericarditis, endocarditis, or myocarditis are visible. Fibrinous vegetations are common in the heart, even when no inflammation exists. Pleurisy and pneumonia are also not unfrequently present; and, rarely, peritonitis or cerebral or spinal meningitis.

The blood contains excess of fibrin, and becomes buffed and cupped during coagulation. The solids generally are diminished, but are in excess in the serum. It is doubtful whether lactic acid can be detected in the blood.

SYMPTOMS.—An attack of rheumatic fever may set in gradually, being preceded by a general state of ill-health for some time; but usually the invasion is prominently marked by chills or occasionally distinct rigors. These are followed by pyrexia, and soon the joints or other structures are affected.

When the disease is established, the symptoms are in most cases very characteristic. The patient complains of general soreness and stiffness, and presents an aspect of pain and suffering, combined with restlessness and weariness, but is unable to move on account of the pains in the joints, being often quite helpless. Usually there is copious perspiration, the patient being bathed in sweat, which has a peculiarly sour or acrid smell, and is usually very acid in reaction. Sudamina are not uncommon, and may be extremely abundant, coming out in successive crops. There are the ordinary symptoms accompanying pyrexia. The pulse is generally full and strong. The tongue is thickly coated, with much thirst, anorexia, and constipation. The urine is markedly febrile, deposits urates abundantly, and sometimes contains a little albumen. Patients cannot sleep on account of the pain they suffer, but there are no particular head symptoms as a rule. Occasionally slight delirium is observed.

The general symptoms are not always in proportion to the extent of joint mischief. In some instances they assume a typhoid character.

It is the middle-sized joints which are most commonly attacked in rheumatic fever, viz., the elbows, wrists, knees, and ankles, but the other articulations are by no means exempt. Usually several are involved in succession, the complaint showing an erratic tendency, and often the symptoms subside in one articulation as they appear in another, but several may be implicated together. The same joint may be attacked more than once in the course of the disease. A disposition to symmetry is frequently noticed.

An affected joint is more or less red, either uniformly or in patches, swollen, and hot. The amount of enlargement varies, and it is due partly to infiltration of the tissues around the joint, partly to effusion into its interior. The skin sometimes pits on pressure. There is con-

siderable pain and tenderness, which is aggravated at night; and any movement causes much distress. In character the pain is dull and aching as a rule, being often so severe as to make patients cry. Frequently the suffering is less when the swelling is considerable.

Temperature.—The *ascent* usually lasts about a week, but it may be longer or shorter. The temperature in most cases ranges from 100° to 104°. The *stationary period* varies greatly in duration; there is generally a considerable difference between morning and evening temperature. *Defervescence* is also gradual and indefinite in most cases, *crisis* being rare. The implicated joints may indicate a higher temperature than other parts. It is in cases of rheumatic fever that hyperpyrexia is most frequently observed, a remarkably sudden rise in temperature taking place, attended with grave symptoms, viz., severe rigors, violent nervous symptoms, sometimes jaundice, diarrhœa, or hæmorrhages, death usually speedily ensuing. The temperature may reach 109°, 110°, 112°, or more, and continues to rise after death. Irregularities in temperature are very common in rheumatic fever, even apart from any complications, and the latter are often not indicated by the thermometer in this disease. There is frequently a disproportion between the temperature and the pulse.

A *subacute* variety of rheumatism is by no means uncommon, especially in hospital practice, which is very troublesome. There is but slight pyrexia, and one or more joints are affected for a long time, with but little change except that occasional exacerbations are liable to occur from slight causes or without any evident cause. The joints are not much deformed, nor are they structurally altered to any extent. The general condition is usually much below par.

COMPLICATIONS.—In most cases certain internal organs and structures are implicated in the course of a rheumatic attack, and the resulting affections are ordinarily classed as complications, but in reality most of them are parts of the disease, and they may exist without any joint affection. At present they will be merely enumerated, as their symptoms and signs are described in other parts of this work, but it must be mentioned that they may come on very insidiously, and should therefore be constantly watched for, especially those connected with the heart, this organ being examined at least twice daily. These complications must necessarily influence greatly the progress of a case. They include—1. Cardiac affections, viz., pericarditis; endocarditis with consequent valvular disease; myocarditis; and the formation of fibrinous deposits in the heart. 2. Pulmonary affections, viz., pleurisy, pneumonia, bronchitis. 3. Rarely peritonitis. 4. Cerebral and spinal meningitis very rarely. The cardiac affections are by far the most common, and are especially frequent in the young, being met with in cases of all grades of severity.

Choreiform movements sometimes complicate acute rheumatism, or

even a distinct attack of chorea, especially in children. The relation between them is a matter of doubt. It is supposed that the chorea is due to the plugging of the small vessels of some part of the brain with particles of fibrin from the cavities of the heart. Rheumatic subjects are liable to serious inflammations in connection with the eye, viz., ophthalmia, scleritis, or iritis.

DURATION AND TERMINATIONS.—The duration of rheumatic fever is exceedingly variable, but favorable cases generally are convalescent within from three to six weeks. Relapses are frequent. The termination in the great majority of cases is in recovery, but permanent organic mischief often remains behind. Sometimes stiffness of joints continues for a considerable period, or they may become chronically affected; they are also liable to subsequent neuralgic pains. Death generally results from internal complications.

DIAGNOSIS.—Gout is the chief disease from which rheumatism has to be distinguished; the points of difference will be considered under gout. Articular rheumatism has also to be diagnosed from other forms. It may be simulated by erysipelas, pyæmia, trichinosis, dengue, or the early stage of glanders. It must be remembered that in an attack of acute rheumatism the joints may not be implicated.

PROGNOSIS.—As regards life and death the prognosis is very favorable, but in many instances it is grave with respect to the future condition of the patient, on account of the organic mischief remaining. The chief indications of danger are a very high temperature or one remaining high for some time; severe nervous disturbance; adynamic symptoms; extensive complications about the heart or lungs; cerebral or spinal meningitis; deficiency of excreta. Choreia is considered to be a highly dangerous complication, especially when accompanied with dysphagia.

TREATMENT.—The indications for managing a case of rheumatic fever may be stated as follows: 1. To study the general comfort of the patient, and protect in every possible way from exposure. 2. To encourage free excretion. 3. To get rid of or neutralize the poison in the blood, if this can be effected. 4. To attend to the joints. 5. To relieve other symptoms. 6. To use every means for preventing complications, and treat them as they arise.

Of course it is desirable that a patient suffering from rheumatic fever should recover as speedily as possible, but it is a matter of much greater consequence that the attack should be passed through without any permanent organic mischief being left behind, than that convalescence should be established within this or that number of days or weeks.

General Management.—The patient should be placed in a comfortable bed, between soft blankets, and should wear a flannel shirt, which must be frequently changed, the limbs being made as comfortable as possible by means of pillows. It is important to avoid anything like

a chill, hence the bed should be carefully protected from all draughts, and patients should not be allowed to throw off the bedclothes, which they are much inclined to do. It is my practice to wrap up all the joints, whether affected or not, in cotton-wool, and also to place a thick layer of this over the front of the chest. The shirt may be cut in such a way as to make a kind of window over the region of the heart, by drawing aside which this region may be examined without disturbing the patient or exposing much of the chest. The wool must be frequently renewed, the surface being dried before each fresh application is made.

The diet ought not to be too low, but should consist of a good quantity of beef tea and milk, regularly administered. Lemonade or barley-water should be freely allowed as a drink, as well as ice to suck. Alcoholic stimulants are not required in ordinary practice, as a rule; in hospital practice, however, patients often need a little wine or brandy, and sometimes considerable quantities are required if there is a tendency to much debility and prostration. The bowels should be kept regularly opened.

Therapeutic Treatment.—Observations have been made by Sir W. Gull and Dr. Sutton, as well as others, with the view of proving that rheumatic fever runs as favorable a course without as with medicines. Possibly this may be true if the measures already mentioned are carefully attended to. At the same time a tolerably extensive experience would lead me to attribute unmistakably good results to the *alkaline treatment*. Whether it shortens the course of the disease or not it is impossible to say, but it certainly appears to have an influence over the joint-affection, and I am inclined to think that it tends to prevent the heart structures from becoming involved. This statement is founded on the fact that at the Liverpool Northern Hospital, where a large number of these cases were admitted, this was part of the treatment usually adopted, and heart complications were very exceptional, provided they were not present at the time of admission. The bicarbonate of potash is what I usually employ, either given in doses of $3\frac{1}{2}$ to $\mathfrak{D}\text{ij}$ every two to four hours; or $3\frac{1}{2}$ or more being dissolved in a quart of barley-water, and administered as a drink during the twenty-four hours. Much larger doses are recommended by some practitioners; while others prefer certain vegetable salts, such as the citrate or tartrate, which may be made into a pleasant drink.

Opium is another remedy of great value. It is best given in the solid form, in doses of one-fourth of a grain to a grain every three or four hours, according to the indications present. It not only relieves pain, procures sleep, and sustains the nervous system, but it also calms the heart's action, and thus by inducing rest for this organ tends to prevent cardiac inflammations. Morphia is also very useful, and it may be administered by subcutaneous injection.

Some of the numerous other plans which have been advocated for the treatment of rheumatic fever require notice.

The salts of soda are preferred by some practitioners to those of potash. Nitrate of potash has been much used, in quantities of from $\frac{3}{4}$ to $\frac{3}{2}$ in the twenty-four hours. Iodide of potassium, phosphate of ammonia, benzoates, and various other salts have also been tried. Lemon-juice has been much recommended, in quantities of from $\frac{3}{4}$ to $\frac{3}{2}$ or more in the twenty-four hours. Having seen it employed in several cases, it did not impress me favorably. Some prefer quinine or cinchona bark in full doses; the former may be conveniently combined with alkalies, as advised by Dr. Garrod. Dr. Reynolds has found tincture of steel efficacious. Potassio-tartrate of iron has also been well spoken of. Many practitioners use colchicum, but it is of doubtful value in rheumatism. Certain remedies which act powerfully upon the heart have been employed, viz., aconite, digitalis, and veratrum viride, especially the last mentioned. They may have the effect of diminishing the tendency to cardiac inflammations, but require careful watching. Recently trimethylamine has attracted attention. Tincture of *actæa racemosa* has also been much recommended.

Dr. Herbert Davis treats acute rheumatism by blistering each joint as it becomes affected, the blisters encircling the limb, this being followed by the application of linseed-meal poultices.

Various baths have been much advocated, viz., the hot-air or vapor bath; different forms of cold bath; the wet pack; or sponging with cold or tepid water.

Local Treatment.—If possible it is desirable not to apply anything to the joints except cotton-wool, but in some instances the pain is so great that local applications must be made. As a rule warm anodyne fomentations or poultices give most relief, containing opium, belladonna, or their active principles. To be of any use they must be put on very hot, be well covered with mackintosh, and frequently changed. I have often tried the local application of an alkaline solution, as recommended by some practitioners, but it has not appeared to be of much service unless opium is added to it. Cold compresses have been much commended. Possibly two or three leeches might be advantageously employed occasionally. Free blistering with liquor epispasticus certainly not unfrequently gives speedy relief. It is not uncommon for a joint to show a tendency to remain chronically affected after the general symptoms have subsided. If this happens, the application of a blister or tincture of iodine may be first tried, but if a speedy effect is not produced, I have found much benefit from strapping the articulation carefully and efficiently with ammoniacum plaster. If there is much effusion, it has been suggested to tap the joint by means of the aspirateur.

The occurrence of hyperpyrexia indicates immediate recourse to the employment of cold, as described under fever, with quinine in full doses

internally, and large quantities of stimulants. The cases successfully treated by Dr. Wilson Fox and others prove that patients may be saved when in an apparently hopeless condition.

The treatment of the several internal inflammations will be again considered in their respective chapters. At present I will only express the opinion that very rarely is any kind of bleeding justifiable, and calomel should never be given. Opium must be used with caution if the lungs are involved, and free stimulation is then necessary. In cerebral or spinal meningitis ice should be applied locally.

Much care is needed during convalescence from rheumatic fever, flannel being worn next the skin, and every form of exposure avoided. The diet should be improved gradually. The patient should be kept under observation until quite convalescent, and have full instructions as to how to guard against future attacks.

2. CHRONIC ARTICULAR RHEUMATISM.

SYMPTOMS.—This affection is common among old persons, usually coming on gradually as age advances, but occasionally following an acute attack. The fibrous structures connected with and around the articulations become thickened and stiff. Hence movement is impaired, and there is more or less dull aching pain, which is worse at night and during damp or cold weather. There are no particular objective signs, and the joints are not much altered in form. Probably this condition may be associated with chronic changes in the valves of the heart.

TREATMENT.—Patients suffering from chronic rheumatism should wear flannel next the skin, and avoid exposure or changes of temperature. Baths of various kinds are useful in different cases, viz., warm, vapor, hot-air, Turkish, cold, salt-water, sulphur, or alkaline baths. These may also be employed locally, and douches are very serviceable. Much good often results from systematic daily friction of the affected joints with some stimulating and anodyne liniment, such as camphor liniment with laudanum, tincture of aconite, or belladonna; also from shampooing and kneading. Local counter-irritation by blisters or tincture of iodine is sometimes beneficial. Good results frequently ensue from effectually strapping an affected joint with some plaster, such as emp. ammoniaci, red plaster, or Burgundy pitch plaster. It is always well to keep the joints bandaged. Patients should be encouraged to take a moderate amount of exercise. Galvanism is strongly advocated by some practitioners, in the form of the constant current.

The internal remedies which yield the best results are tonics, such as quinine and cod-liver oil, or tincture of iron. Iodide of potassium with decoction of bark is also useful, or it may be combined with quinine. Sulphur, guaiacum, sarsaparilla, *actæa racemosa*, and many

other drugs have been recommended as specifics. It is often necessary to give some anodyne to relieve pain and procure rest at night, for which purpose chloral is very efficacious. Various mineral waters are sometimes serviceable, such as those of Buxton, Bath, Harrogate, Cheltenham, and some of the German spas. Vichy water may be tried. The diet should be nutritious and easily digestible. A small quantity of some stimulant is generally beneficial.

3. MUSCULAR AND TENDINOUS RHEUMATISM—MYALGIA.

The muscles are frequently the seat of a very painful affection, supposed to be of a rheumatic character, probably also involving the fibrous structures.

ETIOLOGY.—The *exciting cause* of muscular rheumatism is either exposure to cold and wet or to a direct draught of air; or excessive exercise or strain of the muscles. It is usually met with in adults, and some forms of it are most common among laboring men. One attack predisposes to another. Gout seems to increase the tendency to the complaint.

SYMPTOMS.—In most cases the first attack is acute, and it often comes on quite suddenly, or sets in during the night. The symptoms are pain in the affected muscles, some tenderness, considerable stiffness, with difficulty of movement, by which the pain is much increased. The degree of suffering varies considerably, but it may be intensely severe; sometimes the pain is only felt on moving the affected muscles. In acute cases heat frequently increases it, and it is also worse at night, so that patients suffer more when in bed. Steady pressure in many cases gives relief. There may be a tendency to spasm of the muscles. There are no objective signs, except that it is evident the patient keeps the involved structures as much at rest as possible. Pyrexia is absent, but there may be slight constitutional disturbance due to the pain and want of sleep. No tendency exists towards any cardiac inflammation.

In the acute form the complaint only lasts a few days as a rule, but it often becomes chronic, or is liable to return. When it is chronic, heat generally relieves, while cold and damp weather aggravates the pain.

VARIETIES.—Muscular rheumatism may affect the voluntary muscles in any part of the body, and it is even believed that it may attack the involuntary muscles. Its most frequent and important seats, however, are as follow :

1. *Cephalodynia* or rheumatism of the scalp, which is attended with a form of headache, increased on moving the muscles, with much soreness on pressure.

2. *Torticollis*, *Wry-neck*, or *Stiff-neck*.—This is a very common variety, involving the muscles of the neck, especially the sterno-mastoid.

Usually it is limited to one side, towards which the neck is more or less immovably twisted, great pain being experienced on attempting to turn in the opposite direction. The muscles at the back of the neck may be implicated.

3. *Omodynia, Scapulodynia, Dorsodynia*.—These forms are very commonly observed, especially among laboring men, the muscles about the shoulders and upper part of the back being affected.

4. *Pleurodynia or Rheumatism of the Chest-walls*.—The muscles of the chest are very often implicated, especially those of the left side. The intercostals, pectorals, or serratus magnus may be involved, and it has appeared to me that the pain is frequently seated over the interdigitations of the serratus with the external oblique. It is very commonly situated in the left infra-axillary region. It may be exceedingly intense, and is increased by any movement which brings the muscles into play. Respiration is imperfectly carried on on the affected side, and such acts as coughing or sneezing cause much distress. Not unfrequently the chief pain is localized in a point, and is of a catching character, while pressure on this point increases it, though diffused pressure with the palm may give relief. In other instances it alters its position. This affection simulates pleurisy, but is at once distinguished from it by careful physical examination. It often comes on as the result of cough, and both sides may be then affected; this is frequently observed in phthisical patients.

5. *Rheumatism of the Abdominal Walls* is an exceedingly painful complaint, and may be mistaken for peritonitis. It not unfrequently results from straining during cough.

6. *Lumbago*.—The muscles and fasciæ in the lumbar region are among the most common seats of muscular rheumatism. It may set in with peculiar rapidity, and is usually very severe. Generally both sides are affected. There may be constant aching pain, but this is increased greatly on any attempt being made to bring the muscles into action, and then becomes of a sharp, stabbing character. The patient keeps the spine quite stiff, and generally a little bent forward; any attempt to stand erect or still more to get up from the sitting posture aggravates the suffering greatly. Sometimes the patient cannot stir in bed. Pressure intensifies the pain considerably, and so does heat in many cases.

In addition to these varieties, muscular pains are common enough in the limbs in different parts. Sometimes cases are met with in out-patient practice, in which the plantar fascia and muscles seem to be involved. The diaphragm is occasionally the seat of rheumatism, which causes much distress. The muscles of the eyeball may also be affected.

TREATMENT.—The first indication is to keep the affected muscles at rest, and in many cases this is all that is required. I treat pleurodynia

by firmly strapping the affected side by means of broad strips of plaster extending from mid-spine to mid-sternum (as will be more fully described under pleurisy), and this rarely fails to give complete relief. In lumbago also the application of a wide piece of emplastr. roborans firmly across the back, and over this a flannel bandage passing twice round the body, always affords great comfort. In acute cases warm anodyne fomentations are frequently useful, or turpentine fomentations. Dry heat does not generally answer well, as it increases the pain, but sometimes if persevered in it does good. Gentle friction is often beneficial. In lumbago the subcutaneous injection of a small quantity of morphia generally affords considerable relief. Internally the administration of bicarbonate of potash with iodide of potassium seems to answer best. An opiate may be necessary to relieve pain. Exciting free diaphoresis by giving a warm drink and then wrapping up the patient in blankets, or by the use of a vapor-bath, in some cases brings about a speedy cure. In rare instances it might be advisable to take away a little blood locally, by leeching or cupping.

In chronic cases the internal remedies which do most good are iodide of potassium, quinine, and chloride of ammonium. Sulphur, guaiacum, arsenic, mezereum, various balsams and resins are much used; and likewise colchicum, if there is any gouty tendency. Tincture of *actæa racemosa* has been much vaunted in the treatment of lumbago. Flannel should be worn next the skin. Rest, pressure, cold compresses, friction with stimulating and anodyne liniments, the application of sinapisms or blisters, and local baths or douches with shampooing, constitute the chief local remedies which are found efficacious in different cases of muscular rheumatism. The use of the continuous galvanic current is sometimes attended with marked success. It may be advisable to have recourse to subcutaneous injection of morphia daily for a few days. Acupuncture, the use of Corrigan's irons, or ironing over the affected part with a common flat-iron, a piece of brown paper being placed next the skin, have proved beneficial in some cases.

4. GONORRHOEAL RHEUMATISM.

SYMPTOMS.—During the course of gonorrhœa, especially in young and plethoric persons, an affection of the joints is liable to set in as the result of exposure, the knee-joint being that most commonly attacked. The ankles, feet, or hip-joint are also not unfrequently implicated. There is considerable pain, with a tendency to much effusion and exudation, which gives rise to great tension and swelling, but suppuration does not occur. The inflammation is very apt to recur, and to lead to permanent changes in the joint, which may remain stiff for a long time, with a crackling sensation on movement; or destruction

of the cartilages and ankylosis may ensue. This complaint may become chronic. It is accompanied by much constitutional disturbance.

TREATMENT.—The affected joints must be kept at rest and well fomented. When the knee-joint is implicated, the limb should be extended on a splint, as it is apt to become bent. In the acute stage Dover's powder must be given, in addition to the ordinary remedies for gonorrhœa. Afterwards iodide of potassium is useful, with tonics and stimulants if the patient is weak. Friction, shampooing, and movement of the joint must be carefully practiced when the acute symptoms subside. It might be useful to strap the articulation.

5. RHEUMATOID ARTHRITIS—ARTHRITIS DEFORMANS.

ETIOLOGY.—This is a curious form of joint inflammation which ends in great deformity. It occurs in those who are debilitated and whose circulation is languid. Most cases are met with between twenty and forty years of age, and among females. The complaint is chiefly observed among the poor who have lived badly, but may attack those who are in good circumstances. It is often traced to cold or damp, or sometimes to injury, but there may be no obvious cause. It is doubtful whether it is at all hereditary.

ANATOMICAL CHARACTERS.—At first there is redness of the synovial membrane and increase of synovia. After a time the capsular ligament becomes greatly thickened, irregular proliferations forming, and the synovial fluid becomes much diminished. The internal ligaments may be destroyed, leading to dislocation. Within the articulation fibrous bands form, and there may be cartilaginous or bony masses. The interarticular fibro-cartilages break down and disappear, and also the cartilages covering the ends of the bones, the latter becoming smooth and eburnated to a greater or less extent, being also enlarged, sometimes considerably, and either regular or more commonly very irregular, owing to the growth of osseous protuberances. There is no deposit of urates.

SYMPTOMS.—Rheumatoid arthritis may be acute or chronic. In the former case several joints are involved, but there is no erratic tendency, such as is observed in ordinary rheumatic fever. Pyrexia is present, but there is no profuse sweating, nor does the heart become implicated. In the chronic variety one joint is first affected with a little pain and swelling, but it recovers; in a short time it is again attacked, and remains permanently altered, becoming gradually worse. Other joints are then involved in succession, until all those of the limbs may be observed in various stages of alteration, and even the temporo-maxillary and upper cervical articulations may be implicated. They become rigid, motionless, and either permanently bent or extended; there is more or less distortion and nodulation, with contraction and wasting

of the muscles, the patient being finally completely crippled. At first there may be signs of fluid in a joint. In some cases dislocation takes place. The pain may be very considerable, especially at night. There are no special constitutional symptoms, but the patients are often weak, anæmic, and wanting in tone. The hands are usually crippled before the feet. On the former also little nodular thickenings of the epiphyses of the phalanges, "digitum nodi," are sometimes met with, especially in connection with the terminal phalanges, which are generally supposed to be due to rheumatoid arthritis, but others believe them to be gouty.

Other parts are occasionally involved in this disease, viz., the sclerotic, internal ear, or the larynx.

DIAGNOSIS.—This disease has to be distinguished from gout, acute or chronic articular rheumatism, and gonorrhœal rheumatism. The marked structural changes and deformity distinguish it from ordinary chronic rheumatism, as well as from the gonorrhœal form, the latter also having a different history. The diagnosis from acute rheumatism and gout will be pointed out after the latter affection has been considered.

PROGNOSIS.—Acute cases, if properly treated, may recover. If the disease is chronic and advanced some improvement may be effected, but not much as a rule.

TREATMENT.—Patients suffering from rheumatoid arthritis need a sustaining plan of treatment, which must be persevered in. The general health requires every attention, the diet must be very nutritious and easily assimilable, and wine or some other form of stimulant is decidedly beneficial. Warm clothing, an equable climate, a pleasant occupation, and moderate exercise, with daily baths, are to be commended.

Iron and quinine with cod-liver oil are the most efficient internal remedies. Syrup of iodide of iron, iodide of potassium, arsenic, guaiacum, actæa, and many other medicines have been favorably spoken of. Strychnine or nux vomica may be tried if the muscles have wasted much. Different mineral waters are sometimes beneficial, such as those of Bath and Buxton.

In early cases local counter-irritation is decidedly useful, but it does not produce much effect after a time. In a case under my care free bathing with salt and water followed by friction seemed to do most good; systematic strapping of the joints, friction with various liniments, shampooing, and careful movement may also be attended with benefit. Galvanism might be of some service.

CHAPTER XXIX.

GOUT—*PODAGRA*.

ETIOLOGY.—Gout is a markedly hereditary complaint, and this is shown partly in its development at an earlier age. It is rarely met with under thirty years of age except in hereditary cases; most first attacks occur between thirty and thirty-five, and the disease does not often commence late in life. Males suffer much more than females. Those who are of sanguine temperament, plethoric, and corpulent, are most subject; but thin, nervous, wiry persons are also liable to be attacked. Individuals who work in lead are decidedly prone to become gouty, and, on the other hand, gouty people readily suffer from lead-poisoning. Gout prevails chiefly in cold and temperate climates, especially those which are damp and changeable. Spring is the most favorable season for gouty attacks, and then autumn.

The combination of circumstances most conducive to the development of gout is indulgence in certain alcoholic drinks, with excessive consumption of food, especially animal food, and deficient exercise, with general luxurious habits. It is thus frequently produced *de novo*, being considerably more prevalent among the better classes, as well as among publicans, butchers, butlers, and others who are able to indulge in these habits. There is a form of "poor gout," induced by drinking much beer, while at the same time living badly as regards food, but a hereditary tendency may be discovered in some cases of this class.

Wines and malt liquors are more conducive to gout than spirits. Port wine stands first, then come burgundy, madeira, marsala, and sherry. The lighter wines are not so hurtful. Rum is said to be a frequent cause of gout. Sweet and unfermented cider is also believed to produce it.

The pathological cause of gout is now generally believed to be the presence of excess of *uric acid* in the blood, in the form of *urate of soda*, this substance being generated in excess in consequence of the habits above mentioned, and the kidneys being unable to excrete this excess. During an acute attack uric acid may be detected in abundance in the blood serum, and in long-continued chronic cases it may be obtained from this fluid at any time. It is also found in the fluid of blisters or serous inflammations, and in dropsical accumulations.

The *exciting cause* of a gouty fit may not be evident, or it may be traced to exposure to cold or wet; slight injury; excessive exertion and

fatigue; mental labor; violent or depressing emotions, such as rage or grief; over-eating or drinking, and indulgence in indigestible food.

ANATOMICAL CHARACTERS.—Gout is characterized by the deposit of urate of soda from the blood in various structures, especially in those entering into the construction of the joints, and such tissues as are not very vascular. This is accompanied with signs of inflammation. In an acute case there is increased vascularity, with swelling and effusion into and around the affected joint. Even in the first attack a deposit probably takes place, and this increases with each subsequent paroxysm. In an early case only the metatarso-phalangeal joint of the great toe is usually affected, but subsequently other articulations become involved, so that almost all may be finally implicated. The deposit first occurs in the superficial part of the cartilages, in the form of fine crystalline needles or prisms, forming a more or less close network, and presenting different degrees of opacity. Subsequently the fibro-cartilages, ligaments, and synovial membranes are involved, the entire surface being more or less irregular, and covered with white, chalky-looking deposits, consisting of urate of soda. The synovial fluid may also contain crystals of the same. Owing to the infiltration of the ligaments, the articulations become stiffened or ankylosed. In long-continued cases the joints become ultimately greatly distorted, and the skin over them may be destroyed, exposing the chalky-looking masses. The periosteum and mucous bursæ may be also implicated, and some believe even bone itself.

Deposits are often found in various other parts, such as the external ear, eyelids, nose, larynx, etc.

The kidneys become altered, probably at an early period. At first there is a deposit of urate within the tubuli, which afterwards extends into the intertubular tissue. White streaks are seen in the direction of the tubuli of the pyramids, and at the extremities of the papillæ. Ultimately the organs become greatly contracted and indurated, as well as the seat of extensive deposit. This condition of the kidney will call for more detailed description hereafter.

SYMPTOMS.—Cases of gout are divided into two classes, according as the symptoms are associated with the joints or with some internal organ.

1. *Regular or Articular Gout.*—At first this is an *acute* affection, but after a time it tends to become *chronic*.

A. Acute Gout.—The first attack often comes on without any premonitory indications, but not always, and prodromata usually warn of the approach of subsequent fits. The most frequent precursory signs are derangements of the alimentary canal, with heartburn, acidity, and signs of portal congestion; palpitation of the heart; nervous disturbances, such as headache, giddiness, disturbed vision, drowsiness and heaviness, irritability of temper, languor, restless sleep with unpleasant

dreams, starting of the limbs, cramps in the calves of the legs or other parts; asthmatic attacks; profuse sweats; or changes in the urine, which becomes scanty with much deposit, or very abundant and watery. These symptoms are supposed to result from the presence of the poison in the blood. In some cases the patient feels unusually well, both mentally and bodily, before an attack. There may be some uncomfortable local sensations.

The onset usually takes place during the night, especially from 2 to 5 A. M. In the large majority of cases the metatarso-phalangeal articulation of the great toe is that first affected, generally on one side, but sometimes on both, or they may be attacked in succession. In some instances this joint is alone implicated during several attacks, but in most cases others soon become invaded, a number being affected during a gouty fit, either simultaneously or in succession, though the complaint tends to be limited for a considerable time to the smaller joints of the feet and hands. Exceptionally the knee or ankle is first affected, but very rarely the articulations of the upper extremity.

Characters of the Joint-affection.—The subjective sensations are extremely severe. The pain rapidly increases until it becomes agonizing and unbearable, being described as burning, tearing, plunging, boring, or piercing. There is exquisite tenderness, so that the slightest touch cannot be endured. These sensations are usually much worse during the night, and remit during the day. Soon the joint becomes red and hot, and is much swollen, owing to effusion into its interior, the skin over it being tense and shining, and after awhile there is considerable œdema, with pitting on pressure, some relief accompanying these objective signs. The veins also are enlarged. As the inflammation subsides, desquamation of the cuticle takes place, and troublesome itching is often experienced. Œdema may continue for some time.

It is in the early attacks and in full-blooded persons that the conditions above described are most marked. Subsequently the pain and other symptoms become greatly diminished, and in weakly individuals, especially females, the characters of the joint-affection are not nearly so prominent.

Constitutional symptoms of greater or less severity are present during a paroxysm of gout, being in proportion to the intensity of the local symptoms, and the number of joints involved. Chills or even distinct rigors are felt at the outset, followed by pyrexia, usually attended with perspiration. The urine is very scanty and dark, and deposits urates abundantly, of variable color. Uric acid is absolutely deficient, though relatively in excess. The patient is very restless and sleepless, and not uncommonly suffers from cramps in the legs. The digestive and hepatic functions are much deranged. At the close there may be critical perspiration, diarrhœa, or abundant sediment of urates in the urine.

The duration of a gouty fit varies from four or five days to several weeks, in the latter case there being remissions or intermissions. It increases as the case progresses. Recurrence is a characteristic feature of gout, though it does not invariably happen. At first the attacks generally come on once a year, in the spring; then twice, in spring and autumn; and afterwards more frequently.

Some patients do not recover their usual health for a considerable time after a fit, others are much the better for it. Soon the affected joints become the seat of permanent changes.

B. Chronic Gout.—This term is applied to those cases in which the joints become permanently much altered in structure and form; and where the attacks are frequent, as well as chronic in duration and intensity, indeed in some instances being never altogether absent; at the same time other structures becoming involved. The articulations become stiff, immovable, enlarged, nodulated, and deformed, owing to the extensive deposit in their structures. The skin appears blue and congested over them, the veins being enlarged. Finally it may rupture, masses of urate being exposed, named “chalk-stones or tophi,” which may be discharged as a yellowish-white substance, or suppuration and unhealthy ulceration is set up.

In course of time other structures are affected, such as tendons, bursæ, the periosteum covering the shafts of bones, aponeuroses, and the sheaths of muscles. Gouty abscesses may form in connection with these deposits. Small deposits may also be observed in the helix of the external ear, the cartilages of the eyelids, the nose, and the sclerotic. At first they are liquid, and when punctured a whitish matter is discharged, containing abundant crystals; ultimately they become solid and form little hard nodules or beads. These chalk-stones sometimes set up inflammation, and hence they are not always of uniform composition; a little phosphate of lime may be mixed up with them.

Patients suffering from chronic gout are almost always weak and wanting in tone. They may have a sallow and pale aspect; or are sometimes plethoric but flabby-looking. They suffer from various disorders of digestion, as well as disturbances about the heart, in the way of palpitation or irregular action, being also irritable or depressed and restless, and subject to cramps, twitchings, tic douloureux, and other nervous disorders. A peculiar grinding of the teeth has been noticed in gouty subjects. From time to time there may be a little feverishness. The urine is generally pale, of light specific gravity, deficient in solids, and often slightly albuminous; it sometimes contains casts, there being, in fact, permanent disease of the kidneys established. The skin is often subject to various eruptions, such as urticaria, erythema, eczema, psoriasis, prurigo, and acne. The nose is sometimes the seat of daily paroxysms of great heat and redness.

2. *Irregular, Non-articular, Misplaced, or Retrocedent Gout.*—These terms are applied to gout when it attacks internal parts, which it may do from the outset; or it is supposed it may recede suddenly from the joints and involve internal organs by metastasis, then being specially called “retrocedent.” The chief complaints usually attributed to gout are as follows:

a. Nervous disorders, such as severe headache and vertigo; mental disturbance, the intellect being impaired, or delirium or mania setting in as the result of retrocedent gout; epileptiform seizures; various neuralgæ and other morbid sensations; startings of the limbs, cramps, or local paralysis. It is believed by some that gout may lead to a form of meningitis. Apoplexy is common among gouty subjects, but it is probably due to the fact that the vessels are generally diseased. A gouty sciatica has been described, due to implication of the sheath of the sciatic nerve, which may extend up to the spinal cord and its membranes, and lead to their destruction.

b. Derangements of the digestive organs. The stomach is one of the organs most commonly affected. There may be actual gastritis; or merely a neurotic disturbance, indicated by sudden spasmodic pain of great intensity but relieved by pressure, with a sense of oppression, great anxiety and distress, and sometimes much prostration and collapse. Dysphagia is occasionally complained of. In some cases intestinal colic and diarrhœa arise from gout. There is often evidence of the liver being out of order.

c. Cardiac disturbance. There is no true gouty cardiac inflammation, though white patches on the pericardium and changes in the valves are frequently observed in chronic cases. The cardiac action is, however, liable to become gravely disordered, being weak, or very slow or rapid, or irregular or intermittent; at the same time the pulse is feeble and small, and there is a tendency to syncope or collapse. Painful or disagreeable sensations are experienced over the cardiac region, with a feeling of constriction, dyspnœa, and much anxiety.

d. Pulmonary affections. A form of asthma is often met with in gouty patients, and also bronchial catarrh, which is attended with much cough. Pulmonary congestion may arise, but inflammation is very uncommon.

e. Urinary complaints. The changes in the kidneys have been already alluded to. Chronic cystitis and urethritis are not infrequent, especially among old people. Gouty persons often suffer from gravel and calculus, and oxaluria is observed in many cases.

DIAGNOSIS.—The chief points of difference between gout, rheumatism, and rheumatoid arthritis are shown in the following table:

	GOUT.	RHEUMATISM.	RHEUMATOID ARTHRITIS.
1. <i>Hereditariness.</i>	Very marked.	Less marked.	Doubtful.
2. <i>Social position of patients.</i>	Among the better classes, or those who overfeed and drink.	Among the poorer and hard-working classes chiefly.	Among the poor and ill-fed.
3. <i>Age.</i>	Very rare in early life. Most first attacks from 30 to 35.	Common in early life; chiefly from 16 to 20.	Usually from 20 to 40.
4. <i>Sex.</i>	Much more prevalent among males.	More among males, but to less degree.	Chiefly among females.
5. <i>Mode of onset.</i>	Often no obvious cause of first attack, and this is frequently preceded by digestive derangements, and other premonitory symptoms.	Usually follows an obvious cause, viz., cold, and frequently no previous symptoms.	Exciting cause may be evident or not. Preceded by much exhaustion and debility in some cases.
6. <i>Joint affection.</i>	The smaller joints are most affected, especially the great toe; no erratic tendency. Local symptoms very intense, with much oedema, a shining appearance, enlarged veins, and desquamation after the attack. In time permanent enlargement with distortion, and deposit of urates.	Medium sized joints most involved; erratic; symptoms less severe, and less oedema present; no enlargement of veins or desquamation.	All joints equally attacked; not erratic; symptoms are not severe, but tend to long continuance. Ultimately deformity is produced, but no deposit of urates in joints.
7. <i>General symptoms.</i>	Pyrexia, variable in amount; much constitutional disturbance; considerable morning remissions.	Considerable pyrexia; more continuous.	Only slight pyrexia.—Symptoms of debility.
8. <i>Perspiration.</i>	No special characters.	Very profuse and acid.	No acid sweats.
9. <i>Course, duration, and progress.</i>	Early paroxysm of short duration; great tendency to recurrence, and to periodicity.	Attack of longer duration; much less tendency to recurrence; not periodic.	Subacute, and gradually progressive; often no complete intermission; not periodic.
10. <i>Complications.</i>	Affects especially the stomach, brain, kidneys; also gives rise to nervous disturbance of the heart, but not inflammation.	Very liable to cardiac inflammations; also lung inflammations.	Nothing in heart or other organs.
11. <i>Uric acid in blood.</i>	Present.	None.	None.
12. <i>Tophi in auricle, etc.</i>	Present.	None.	None.
13. <i>Urine.</i>	Deficiency of urates before and during the fit, followed by excess; albuminuria common; may have casts, indicating kidney disease.	Febrile; sometimes slight albuminuria.	No special characters.

PROGNOSIS.—Acute gout is rarely immediately fatal, but when it attacks internal organs there is considerable danger. The complaint is always liable to return, but much depends upon the mode of living which the patient adopts. The prognosis is worse in proportion to the youth of the patient; the degree of hereditary tendency; and the frequency of the attacks. Chronic gout decidedly shortens life. The most serious signs are those indicating advanced renal disease, with non-elimination of uric acid. Gout materially diminishes the chances of recovery from acute diseases and injuries.

TREATMENT.—1. *During the Paroxysm.*—It is well to give a brisk purgative at the commencement of a fit of gout, such as a calomel and colocynth pill, followed by a black draught. *Colchicum* is the specific remedy for this affection, but it must be given with due care. From ten to twenty minims of vin. colchici should be administered every six or eight hours, and it may be combined with the bicarbonate or some vegetable salt of potash freely diluted, or with carbonate of lithia.

A free action of the skin should be kept up by the use of diaphoretic drinks, or the vapor or hot-air bath might be employed in some cases. A low diet is generally indicated at first, which should be gradually improved, but it may be necessary for weak patients to have a good deal of liquid nourishment. As a rule all stimulants ought to be stopped, especially when the patient is young, but sometimes it is advisable to allow a certain quantity of brandy, well diluted. If there is much pain and restlessness, opium must be given at night, in the form of Dover's powder, or subcutaneous injection of morphia may be had recourse to.

As regards *local treatment*, rest is of course essential, and an elevated position should be adopted for the affected parts. These should be wrapped up in flannel or in cotton-wool covered with oil-silk. If the local symptoms are very severe, warm fomentations or poultices containing opium, or localized steaming may be tried; or it may be advisable to apply anodynes, such as belladonna liniment, tincture of aconite, or a solution of atropine or morphia. Removal of blood is extremely rarely called for, but sometimes a blister is useful. As the inflammation subsides gentle pressure by means of a bandage or elastic stocking is often serviceable, in order to get rid of the œdema and other conditions which are liable to remain; gentle friction may also be employed.

Should gout attack internal organs, it is requisite to endeavor to excite inflammation in the joints by means of friction, heat, or sinapisms. In the neurotic affections, opium with stimulants, such as ammonia, ether, camphor, musk, are the remedies indicated, as well as alcoholic stimulants. External heat or sinapisms are also of much value in these conditions. Inflammatory complications may require the application of a few leeches or of a blister, but in most cases gouty patients will not bear much depression.

2. *During the Intervals.*—There is no disease for the management of which a careful study of the patient and everything connected with him is more necessary, than in the case of gout. In the early stage a practical cure may often be effected, especially in acquired cases, in so far that no further attacks come on, provided due attention is paid to certain rules. When the complaint is hereditary also, it may be prevented from exhibiting itself, or at all events may be put off until a later period in life, by the exercise of proper care.

Diet requires strict regulation, and must necessarily vary much in different subjects. It should be nutritious and easily digestible, consisting of a due proportion of animal and vegetable matters, but nitrogenized and saccharine substances must be limited. Moderation in eating and regularity of meals are important. Tea and coffee may be allowed; also soft and stewed fruits, provided they do not contain much sugar; pastry ought to be avoided.

The use of alcoholic stimulants is a matter calling for much consideration. In young persons total abstinence is to be decidedly recommended, as well as in other cases where there is no obvious necessity for stimulants. The nature and quantity of the stimulant to be taken should be always distinctly stated. Malt liquors and all strong wines ought to be rigidly denied. Lighter wines of good quality, such as claret, hock, moselle, or chablis, may be allowed in moderation. Small quantities of spirits freely diluted are also permissible in some cases, either brandy, whisky, or gin, and they may be taken with effervescent mineral waters. When a change is being made as regards the diet and drink of a gouty patient, it should be carried out gradually and not too abruptly.

With respect to general hygienic management, the following are the chief matters needing attention: Daily exercise in the open air and the avoidance of sedentary habits; proper ventilation; daily bathing, followed by friction, and the occasional use of a warm, Turkish, or tepid salt-water bath; the wearing of warm clothing, with flannel next the skin; abstinence from undue mental labor; the avoidance of late hours at night, of heated and ill-ventilated rooms, and of lying in bed late in the morning; if possible, residence in a warm and equable climate, but if this is not practicable, protection against all sudden alterations of temperature and exposure to wet, with a change to a favorable climate during the winter months.

The digestive organs must be looked to. The bowels should be daily acted upon, a mild aperient being given if necessary. Much mercury is injurious, but there is no harm in giving a little blue-pill occasionally. It may be requisite to administer remedies with the view of improving digestion and relieving portal congestion.

Mineral waters are often useful, but must be regulated in their administration. Those of Buxton and Bath in this country, and various

German waters are considered most beneficial, especially those of Vichy, Wiesbaden, Baden-Baden, Aix-la-Chapelle, Carlsbad, Kissingen, Marienbad, Homburg, Ems, and Wildbad.

It is scarcely necessary to add that everything should be avoided which is known to be likely to bring on an acute attack of gout.

Therapeutic Treatment.—Colchicum is a valuable medicine even between the attacks of gout, when carefully administered; it is best given in the form of extract at night, with extract of henbane or gentian; or a few minims of the wine may be added to other medicines. In a good proportion of cases tonics are indicated. Quinine, tincture or infusion of cinchona, some form of iron, or mineral acids and bitter infusions are frequently serviceable. Guaiacum and ammoniacum are strongly recommended for asthenic gout in old persons. Iodide of potassium is sometimes beneficial. Alkaline and earthy salts are valuable in many cases, given freely diluted and on an empty stomach, especially the carbonates and phosphates of potash, magnesia, or lithia. The salts of lithia have been specially advocated, either the carbonate (gr. v–x), or the citrate (gr. viii–xii). Most of the mineral waters owe their efficacy to some of these salts being dissolved in them. Carbonate of alumina, benzoate of ammonia, phosphate of soda and ammonia, lime-juice, and various other medicines have also been recommended.

When the joints become much altered but little can be done locally. Friction, shampooing, and pressure by means of strapping, might be carefully employed. Sores require the application of some simple dressing. A dressing of solution of a potash or lithia salt has been favorably spoken of.

CHAPTER XXX.

SCORBUTUS—SCURVY.

ETIOLOGY.—Scurvy is a distinct and peculiar disease, though the term is not uncommonly ignorantly applied to a variety of skin diseases. It is met with chiefly among seafaring men, being consequently by far most commonly observed in the hospitals of seaport towns. During the early part of my connection with the Liverpool Northern Hospital a large number of cases were admitted within the year, but subsequently they became less numerous, owing to better regulations being carried out for the prevention of the disease.

Scurvy has been attributed to many causes, such as the use of salt meat or of putrid meat and bad water, or to imperfect hygienic conditions; but my own experience would lead me to agree with those

who believe that it is always due to the want of fresh vegetable diet or of some appropriate substitute. This was invariably the case in connection with the seamen in whom I have observed the disease, and in four cases of land scurvy which have come under my notice, the complaint could be distinctly traced to the same cause. It seems, however, to have broken out under circumstances which indicate that it might possibly arise in other ways. During the siege of Paris numerous cases occurred, which were attributed to insufficient food and bad hygienic conditions.

In what way deficiency of vegetables acts is not known, and all that can be stated with certainty is that it leads to some alteration in the composition of the blood. This has been attributed to a want of potash salts, vegetable albumen, vegetable acids, and various other constituents.

Advanced age, a cold and damp climate or season, exposure, fatigue, and despondency, have been set down as *predisposing causes* of scurvy.

ANATOMICAL CHARACTERS.—In fatal cases there is usually much emaciation, with œdema of the legs. The blood is very dark and liquid, and its coloring matter stains the tissues. Extravasations are met with in the subcutaneous tissue, as well as between, or sometimes even within the muscles, and they are often firmly coagulated or partially organized. Serous and synovial effusions are common, especially pericardial effusion, these being frequently mixed with blood. The organs are loaded with blood, and present ecchymoses and extravasations, being also relaxed and softened. Ecchymoses may be seen under the serous membranes, and the mucous membranes are red and swollen in some parts. Fatty degeneration of the muscles is said to occur. The characteristic appearances associated with scurvy during life continue after death.

SYMPTOMS.—Scurvy sets in gradually and insidiously, and cases are met with in all grades of severity, but in a well-marked case the symptoms are very striking. The patient presents a peculiar unhealthy aspect, the face being sallow and of a dirty-yellowish hue, combined with puffiness about the eyelids, and anæmia, which is well seen in the mucous membranes. There is more or less emaciation, but it may not be very marked even in bad cases. The subjective sensations are those of languor, debility, fatigue, shortness of breath, faintness, pains and soreness in the limbs, mental depression and despondency. These symptoms vary in degree, sometimes amounting to complete prostration, with a tendency to sudden syncope, which may prove fatal.

The mouth affords some characteristic signs. The gums are either more or less swollen, turgid, dark, and spongy, sometimes reaching to or even much beyond the level of the teeth; or they become ulcerated and gangrenous, dropping off in masses, and exposing the teeth or jaws. From the first they readily bleed, and after a time blood oozes

constantly from them. The teeth are very tender, so that chewing becomes impossible, and they are also soon loosened or even drop out. Necrosis of the jaws occasionally occurs. The breath has a peculiar and excessively foul odor.

The legs present small purple spots, corresponding to and being dependent upon extravasations of blood into the hair-follicles. They are chiefly observed below the knees, but are not uncommon, though less abundant on the thighs, being rarely seen on the abdomen or arms. In addition to these there are more or less extensive irregular ecchymotic patches, presenting various hues, according to the changes which the coloring matter of the extravasated blood has undergone. Brawny indurations can be felt, due to deeper extravasations, especially in the hams and calves, and these are often very painful and tender. Edema of the feet and legs, and desquamation of the cuticle are common symptoms. There is much stiffness and pain in movement, and a constant feeling of aching and contusion in the legs is experienced.

In some cases hæmorrhages take place from various mucous surfaces. Ulcers are occasionally formed, or old ulcers may break out anew or assume an unhealthy aspect, being covered with large bleeding granulations. It is said that old fractures sometimes become disunited, bones soften, or epiphyses become separated.

The alimentary canal is usually out of order. The appetite is impaired, as a rule, but sometimes patients feel inclined for food but cannot chew, and certainly as soon as they are able to masticate the appetite generally returns. In severe cases there may be nausea and vomiting. Obstinate constipation is the rule, but occasionally the bowels are relaxed, and the stools may contain blood, or actual dysentery may be present as a complication. There is no pyrexia usually. The pulse is infrequent, weak, and small. The patient often passes restless nights. The urine is deficient in quantity, dark-colored in some cases, and tends to decompose rapidly. Urea, phosphates, and potash are deficient. Occasionally blood is mixed with the urine.

Morbid conditions of the blood have been described, but there is no certainty on this matter. Garrod states that potash is much diminished in quantity. Dr. Leven affirmed that in cases in which he examined the blood, during the siege of Paris, he found fibrin in excess and corpuscles diminished by one-half.

DIAGNOSIS.—The only disease likely to be confounded with scurvy is purpura; the diagnosis will be pointed out after the latter has been considered.

PROGNOSIS.—All the cases of sea-scurvy which came under my notice rapidly recovered, with one exception, and in that case death resulted from an accidental complication, viz., apoplexy. Therefore the prognosis is highly favorable, if proper treatment can be adopted. In my experience sporadic cases of land-scurvy do not seem to be so easily

cured, and in one instance acute gastro-enteritis and pneumonia set in without any evident cause, ending in speedy death; while in another recently under my care no treatment seemed to produce any result, and the patient sank from the direct effects of the disease, there being high pyrexia.

TREATMENT.—Sea-scurvy is one of the most satisfactory diseases to treat, speedy recovery being brought about in the great majority of cases, provided the necessary remedies can be obtained, viz., plenty of fresh, soft, and succulent vegetables, with from 3iv to 3viij of lime- or lemon-juice daily. Potatoes and cabbages constitute the best vegetables. Oranges, lemons, citrons, and other fruits of this class are also very valuable. Water-cress, garden-cress, mustard, scurvy-grass, sauerkraut, spruce, fir, and various other vegetable growths have obtained repute in the treatment of scurvy, and might be tried if the more reliable remedies cannot be procured. It is stated that vegetables act best when uncooked, but ordinarily it is unnecessary to give them in this condition.

Liquid nutritious food is needed, such as beef tea and milk, often in considerable quantity, and, as soon as the patient can chew, meat should be allowed. Stimulants are frequently indicated, but should be given carefully and in small quantities. In a few days it is advisable to administer some tonic, such as quinine and iron, which aids recovery by exciting appetite, strengthening the patient, and improving the quality of the blood.

The mouth must at first be frequently washed out with some dilute antiseptic, of which one of the best is Condyl's fluid. At a later period a mild astringent, such as alum water, may be used. Constipation is generally a troublesome symptom, and is best treated by enemata. Fomentations may be applied to the painful swellings in the legs. If serious hæmorrhage occurs, astringents must be given. Ulcers may be dressed with lime-juice, but they improve rapidly under its internal administration.

Many remedies have been recommended in the treatment of scurvy, such as salts of potash, solution of various vegetable acids, especially citric, and phosphoric acid. In my experience they are not reliable. Raw meat and seal's flesh have also been employed, it is said, successfully.

The prevention of scurvy is a most important matter in connection with those persons who lead a seafaring life. There can be no question but that the disease may be completely prevented by the use either of fresh vegetables, preserved vegetables, or of proper lime- or lemon-juice, which should be served out daily. Many of the specimens of so-called lime-juice used on board ship are worthless; often only a solution of citric acid is used, which decidedly does not prevent the disease. The free employment of vinegar and the vegetable salts of potash has been

recommended. It is important to attend to all hygienic and other measures for maintaining the general health of the men, and to avoid undue exposure.

CHAPTER XXXI.

PURPURA.

ETIOLOGY.—Purpura is due to a peculiar unhealthy condition of the blood and tissues, which may probably be originated in many ways, but its causes are not at all clearly defined. The disease is quite distinct from scurvy. It may depend upon unhealthy hygienic conditions, deficiency of proper food (? vegetables), intemperance, and other lowering agencies; or it may arise in connection with various acute fevers, or in the course of many chronic affections, such as albuminoid disease, syphilis, cancer, Bright's disease, or cirrhosis of the liver, while it often accompanies jaundice. Sometimes it follows the administration of iodide of potassium. Purpura may affect persons apparently perfectly well, even in its worst forms. Amenorrhœa has been stated as a cause. The old and young are most liable to be affected.

ANATOMICAL CHARACTERS.—Purpura is characterized by rupture of the capillaries and escape of the blood in various parts, indicated by petechiæ and ecchymoses on the skin, hæmorrhages from mucous and sometimes from serous surfaces, and extravasations into the cellular tissue or muscles, or into certain organs, such as the brain, lungs, and pelvis of the kidneys. Organs are often found diseased, this being the cause of the purpuric condition. The blood may be quite normal, or dark and fluid. The cutaneous capillaries are usually healthy, but there is reason to believe that they have sometimes undergone structural degenerative changes.

SYMPTOMS.—Purpura is described under two chief forms, *purpura simplex* and *purpura hæmorrhagica*; in the former the hæmorrhages are only observed in connection with the skin; in the latter they take place also from mucous surfaces, and sometimes into serous cavities or into the substance of organs, while the cutaneous hæmorrhages are generally more abundant. The skin presents various forms of extravasation, viz., minute points (stigmata), petechiæ, vibices, and extensive ecchymoses. These are observed chiefly on the legs, and may appear in successive crops, each lasting a variable number of days. Their appearance is often favored by much standing. From the first pressure produces no effect on the color, which is often bright-red at the outset, but afterwards becomes darker, being purple, violet, or almost black in

some cases. The usual changes of color are seen as the extravasations disappear. The spots are generally roundish, and have a well-defined outline at the commencement, but subsequently they gradually fade into the surrounding skin. They are not at all raised, but there is often hardening and swelling of the subcutaneous tissue. Blebs containing sanguineous serum sometimes form under the cuticle, and in rare instances the skin becomes gangrenous.

The hæmorrhages from mucous surfaces which may be met with are epistaxis, hæmorrhage from the gums and mouth, hæmatemesis, melæna, hæmaturia, hæmoptysis, and menorrhagia. Rarely bleeding from the ear takes place. Extravasations may also escape into the mucous membranes, such as the conjunctiva, or that covering the palate, cheeks, or gums. Little blisters containing bloody serum sometimes form on the tongue or cheeks. Extravasation into organs is rare, but death has occurred from pulmonary or cerebral apoplexy.

The general symptoms vary much, and are considerably modified by the conditions under which the purpura arises. There are often premonitory symptoms for some time, such as general pains, languor, and debility, but not always. The attack may be ushered in by pyrexia and occasionally paroxysms of a hectic type have been noticed. Pains in the abdomen, epigastrium, loins, chest, and limbs are often complained of. The digestive organs may or may not be impaired. There is always more or less debility and sense of depression, and in severe cases this becomes extreme, being accompanied with marked anæmia if much blood has been lost, and a tendency to faintness or syncope. The pulse is usually feeble, quick, and compressible. The urine may be albuminous, independently of the presence of blood, and sometimes contains casts.

Purpura has a very variable duration, being either *acute* or *chronic* in its progress. It usually terminates in recovery if uncomplicated.

VARIETIES.—In addition to those already mentioned, the following are described: 1. *Senilis*, which is met with in old people, owing to degeneration of their vessels, and especially on the exposed and irritated arms of old women. 2. *Rheumatica*, occurring in rheumatic individuals and attended with much pain. 3. *Urticans*, where *purpura simplex* accompanies urticaria. 4. *Papulosa*, which is merely a form of lichen. Petechiæ may be observed in connection with many skin diseases.

DIAGNOSIS.—Scurvy is the main disease from which purpura has to be distinguished. It might possibly be mistaken for ecchymosis from injury, flea-bites, typhus fever, or the hæmorrhagic form of measles. It must also not be confounded with the *hæmorrhagic diathesis*.

In addition to the difference in the etiology of the two diseases, purpura not being due to the want of vegetable food, and the use of this class of diet or of lime-juice not having any material influence in its

cure or prevention, scurvy has the following characters to separate it from purpura: 1. The peculiar color and sallowness of the skin. 2. The state of the gums. 3. The greater extent of the ecchymotic patches. 4. The presence of brawny indurations in the substance of the limbs, accompanied with much pain and stiffness. 5. Extensive desquamation of the cuticle.

PROGNOSIS.—The prognosis of purpura will depend greatly on its cause, and especially whether it is associated with any organic affection. The *hæmorrhagic* variety is very dangerous, but I have known recovery take place, apparently spontaneously, when all treatment had failed, and the case had been given up as hopeless. The simple form is often very tedious, and liable to return.

TREATMENT.—In the first place it is necessary to inquire into all hygienic conditions, and improve them if they have been at fault; at the same time giving a nutritious diet, consisting of both animal and vegetable constituents, stimulants being also often required.

Rest in the recumbent posture is generally advisable, or at any rate the legs should be kept up. Attention must be paid to any cachexia present, or to any organic disease on which the purpura may depend. If there is much plethora, saline purgatives may be given at the outset.

The chief remedies employed for the cure of purpura are tincture of iron in full doses, turpentine, tincture of larch bark, and arsenic. The first is most useful, and it may be combined with quinine and dilute sulphuric acid. In the hæmorrhagic form, gallic or tannic acid, alum, ergot of rye, acetate of lead, or subcutaneous injection of ergotin might prove serviceable. Other astringents should be freely administered, but they often fail. Local astringents, pressure, and cold, especially by means of ice, may be tried where this is practicable. Careful bandaging of the legs, or the use of an elastic stocking, is advantageous in many chronic simple cases.

CHAPTER XXXII.

RACHITIS—RICKETS.

ETIOLOGY.—Rickets is a very prevalent disease in this country, and the out-patient practice of any hospital presents a large proportion of cases. It is unquestionably a *general* or *constitutional* disorder, and can in the large majority of instances be traced to some obvious cause or causes, leading to imperfect nutrition.

This complaint always sets in during infancy or childhood, especially

during the first or second year. It is not a congenital disease, and rarely appears before six or seven months after birth; it may commence as late as seven or even nine years of age. Some believe that it is hereditary, but in most instances this is certainly not the case. Early marriages, intermarriage, and ill-health or advanced age of the father, have been set down as causes, but there is no evidence of this, nor is rickets a mode of development of tubercle or syphilis. A large proportion of cases of rickets occur in children who have been brought up by hand throughout or from an early period, and have been improperly fed artificially. Prolonged suckling is sometimes the cause, the milk becoming unfit for proper nourishment; or too frequent suckling. The state of health and general nutrition of the mother has also a material influence in the causation of this disease, through the milk, and hence all imperfect hygienic conditions, deficiency of food, chronic diseases, and other agencies which impoverish the blood and undermine the health of the mother, tend to produce rickets in the child, unfavorable sanitary conditions also tending directly to induce rickets, especially want of fresh air and sunlight. In some instances it appears to depend upon some previous debilitating disease, particularly gastric and enteric catarrh with long-continued diarrhœa.

Occasionally a child becomes rickety in the midst of a family, but if one is affected those who follow generally suffer also. Among the poorer classes it is very common for all the children after the second or third to be the subjects of this disease. It is far less frequent in country places and small towns than in large towns and cities.

ANATOMICAL CHARACTERS AND PATHOLOGY.—The bones present the chief morbid changes associated with rickets. These consist in an increased growth or proliferation of the epiphyses and periosteum, accompanied with delayed, imperfect, and irregular ossification. As a result the ends of the long bones are greatly enlarged; the flat bones are thickened, especially at their growing edges; all the bones are softened, and hence curvatures and angular deformities arise, leading to more or less distortion.

The degree of enlargement of the epiphyses varies considerably, and there is much difference in the relative amount of this and of softening of the bones. They are increased chiefly in breadth, not because the growth is lateral, but on account of the pressure and muscular action to which they are subjected. The layer of cartilage in which ossification normally proceeds is much developed, and the cancellous tissue of the bone is increased. The material is very soft, and a quantity of red pulp can be expressed, consisting of fat, nucleated cells, and blood-corpuscles.

The shafts of the long bones may be so softened that they can be easily bent or cut with a knife or scissors; the periosteum is vascular and thickened, owing to the formation of a tissue from which bone is

normally produced, and this is especially noticed at the line of junction between the bone and cartilage. Pathologists hold very different views as to the original cause of this softening of the shafts. Some believe that there is at first an absorption of the calcareous matter already deposited, as well as impeded ossification; probably, however, there is no such absorption, but the old bone disappears from within in the ordinary course of things, as in health, while the newly formed external material which takes its place does not undergo proper ossification. Much red pulp is contained within the medullary canal and the various interstices of the bone.

Some important deviations are observed as regards the mode of deposit of the calcareous matter during the progress of ossification. Instead of there being a tolerably regular line where calcification is proceeding at the junction of the bone and cartilage, as is normally observed, this line is very unequal, the calcareous matter in some parts shooting far up into the cartilage, portions of which may also become completely isolated, and in advanced cases there are often distinct spots of calcification. Some of the cartilage-cells are very large, and Kölliker and others describe them as being directly converted into lacunæ by a deposit in their walls, canaliculi forming at the same time. Sir W. Jenner states that the calcareous matter is deposited within the cells, which may become completely filled, the process in fact being merely one of petrification.

Another abnormal condition of importance is, that the medullary cavity passes into or beyond the line of ossification, while distinct spaces form in the epiphyses, which may contain a fibrous vascular stroma, resulting from fibrillation of the interstitial tissues, around which calcification takes place.

The flat bones are similarly altered, being thickened from periosteal formation, especially near their growing edges, as well as softened, consisting chiefly of diploë containing much red pulp.

The chemical composition of rickety bones becomes greatly altered; the organic matter is markedly in excess, being in the proportion of 79 to 21 inorganic, and neither gelatin nor chondrin can be obtained.

Certain obvious changes arise as the result of the altered structure of the bones. The spinal column and long bones are bent and twisted, producing often much deformity. The chest and pelvis are peculiarly distorted. Where a long bone is bent, its medullary cavity is narrowed, and may be ultimately completely closed by callus. Partial or complete fractures are not uncommon, but the periosteum remains uninjured.

The skull is large, its sutures remain long united and its fontanelles open, while the bones forming it are especially thickened at a little distance from their edges, so that the sutures appear grooved, with a little elevation on either side. In some parts the bones may be thinned or even perforated, so that the periosteum and dura mater meet.

Should the rickety process subside, the enlargement of the epiphyses diminishes, and they often ossify rapidly, growth of the bones in length being thus interfered with, leading to the production of dwarfs. The shafts also become firm, remaining permanently more or less deformed. The head continues to grow, and often becomes very large.

The pathology of the morbid conditions observed in rickety bones is by no means agreed upon. Some believe that the proliferation of the epiphyses and periosteum is primarily due to inflammation, and that the resulting disturbance of circulation prevents the deposition of calcareous salts. Others think that the calcareous matters are not supplied in sufficient quantity; and still others that they are absorbed, or are prevented from being deposited owing to the presence of excess of lactic or some other acid in the blood, which keeps them dissolved, and they are then excreted by the kidneys. Sir W. Jenner is of opinion that there is no deficiency of lime salts, but a malposition.

The tissues in rickety children are relaxed and wanting in tone, and all structures in connection with bones are arrested in their growth. The muscles become small, pale, and flabby.

Important internal morbid conditions are frequently met with, which can only be enumerated at present. These are: 1. Collapse and emphysema in various parts of the lungs, in connection with the deformed and weak thorax. 2. Bronchial catarrh, extensive bronchitis, or pleurisy. 3. White patches on the pericardium and spleen, due to the distorted chest. 4. Albuminoid infiltration of most of the organs, involving sometimes all the absorbent glands, but especially the mesenteric glands. 5. Chronic hydrocephalus, either meningeal or ventricular. 6. Enlargement of the brain, due either to albuminoid infiltration or increase of the neuroglia, and not to true hypertrophy. 7. Gastro-enteric catarrh.

SYMPTOMS.—At an early period the symptoms of rickets are often not very definite, and the onset of the disease is insidious. Generally there is marked disturbance of the alimentary canal, with some pyrexia, the pulse being quick and irritable. The child alters in disposition, becoming dull and sad, or peevish and irritable; and is languid, refusing to play or be amused. It may cease to walk if it has already commenced, or will not show any signs of making the attempt. At the same time there is wasting, the tissues becoming flabby, and the face pale. These and other non-characteristic symptoms may be present, but there are three signs which Sir W. Jenner looks upon as pathognomonic. These are: 1. Profuse sweating about the head, neck, and chest, especially during sleep, attended with enlargement of the veins, the other parts of the body being often at the same time hot and dry. 2. General soreness and tenderness of the body, so that the child cries on being touched, or even on the approach of any one; cannot bear to be washed; and keeps quite still, avoiding every movement. Older children do not

suffer so much, but complain of pains in the limbs. 3. Throwing off of the bedclothes at night, in order to try to get cool. At this time also the urine may be very copious, and may contain abundant calcareous salts or phosphates.

Sooner or later the changes in the bones are revealed, and in outpatient practice it is generally found that these are more or less obvious when the child is brought to the hospital. The enlarged ends of the bones are distinctly seen or felt, so that the joints appear swollen and knobby, especially those which are least covered, such as the wrists and ankles, having also a loose feeling. A string of nodules is felt along each side of the chest at the junction of the ribs with their cartilages. The limbs are variously distorted and curved, as well as the clavicles, which exhibit two bends; the spine is curved and deformed, and in many cases also the pelvis and chest. The chest-deformity will be considered later on, but it is impossible to give a description here of the various other distortions met with, which differ according to the movements carried on, the mode in which the child is supported and carried, and the ordinary position assumed, and they will vary with the age at which the disease sets in; they result from pressure and gravitation, and not from muscular action. In some cases the enlargement of the joints is most evident; in others the distortion of the limbs.

The head and face present well-marked characters. The former is large, and has a long antero-posterior diameter, with a high, square and often projecting forehead; the anterior fontanelle remains unclosed much beyond the ordinary period; and in many cases the sutures are open and grooved, with a thickening on each side. In some parts, and especially over the occiput, the bone may be very thin or entirely absent, but this last condition is very rare. The hair on the scalp is generally thin. The face looks small but broad, and is often turned up, owing to the head being thrown back or sinking between the shoulders. It assumes a staid, sedate, or pensive expression, and becomes "old-looking." The teeth appear very late, in many cases none having come through at the end of a year or more, while they also rapidly decay or fall out, being deficient in enamel.

The general symptoms progress in the course of the disease; emaciation, flabbiness of tissues, debility, and loss of power are more or less marked, the child being sometimes completely helpless and unable to sit up or move in the least, the head dropping in any direction. The skin often becomes thick and opaque, and covered with downy hairs, while sweating continues. The alimentary canal is more or less deranged. Hectic symptoms may set in. All development and growth is arrested, the body remaining short and stunted.

Much difference of opinion exists as to the state of the intellect in rickety children. Many believe that the mental powers are above par, but this is certainly not the case, although they may appear to be very

precocious, and are often amusing; in some instances they become stupid and almost imbecile, this being evident in the expression of the face. Rickety children are late in talking.

The urine is pale and abundant, contains an excess of earthy phosphates and lactates, and sediments of oxalate of lime often form. Urea and uric acid are said to be deficient. Calculi are not uncommon.

During the course of rickets symptoms indicative of the complications already mentioned frequently appear. Among the most common and dangerous are bronchitis and gastro-enteric catarrh. Laryngismus stridulus and convulsions are also very liable to occur. If death happens, it is generally due to one of these complications, but may be the result of the cachexia attending the disease itself.

Cases of rickets present all grades of severity and advancement. When a favorable termination ensues, the symptoms gradually subside, strength is restored, the bones ossify, but usually more or less permanent distortion remains, which, however, may frequently be greatly diminished by appropriate treatment. Children who have suffered from severe rickets rarely attain the ordinary height.

PROGNOSIS.—Most cases of rickets may be cured, if taken at a sufficiently early period and treated properly. Its complications are very serious, and the presence of rickets adds much to their gravity, especially in the case of chest-affections. The thoracic and pelvic deformities which it produces are very injurious.

TREATMENT.—The first matter to attend to is the dieting of the child, which is almost always at fault, and about which thorough inquiry should be made, with the view of correcting anything that may be wrong. The breast should only be taken at regular stated intervals and for a certain time; or the child should be weaned if suckling has been too long continued, or may be partially artificially fed. Often the mother's health requires attention. The feeding of children artificially needs the greatest care in this disease. Milk with a fourth part of lime-water constitutes the most important article of diet, to which may be added a little cream and milk-sugar. These must be given in regulated quantities, and the feeding-bottle should be kept scrupulously clean. It is a common custom to give young infants considerable quantities of arrowroot, corn-flour, and various artificial foods of a farinaceous character, and these certainly do much harm. Only a very small quantity should be allowed. Ass's and goat's milk are useful if they can be obtained. For older children, beef tea in small quantities and milk-puddings are valuable, and later on they may have pounded meat, or be allowed to suck a large piece of underdone beef, or be given the juice pressed out of this. Potatoes well mashed, with gravy, may also be permitted in moderation. All indigestible substances must be avoided.

Hygienic management requires much attention. The ventilation of the bedroom must be looked to, and the child should have a separate

bed, if possible, kept very clean and dry. After the early symptoms have subsided, the patient should be much out of doors whenever weather permits, in the sun, a dry bracing air of moderate temperature answering best. The clothing must be sufficiently warm, and the common custom of exposing the lower part of the body ought to be avoided. A change to the seaside is very beneficial. The body should be washed over twice a day with warm water; and later on warm salt-water bathing followed by friction is useful. It is important to look to the position assumed by the child, and to the movements carried on, so as to prevent deformity. Straight wooden splints lightly applied along the legs, and extending a little beyond the feet, are of use for the purpose of preventing the child from attempting to walk. The abdomen should be well supported by a bandage. Any distortion of the limbs must be removed, as far as possible, by systematic efforts to straighten them.

Therapeutic Treatment.—It is almost always necessary to treat the alimentary canal, as this is usually out of order. Rhubarb with carbonate of soda, magnesia, or chalk, answers very well, and an occasional dose of castor-oil may be given. Gray powder is useful now and then, when the stools are offensive, but should not be administered as an habitual thing. Lime-water also improves the state of the stomach and bowels. Alkalies and bitters are recommended by some practitioners. At a later stage the two great remedies are cod-liver oil and some preparation of iron, care being taken that the limbs are straight before these are administered. The former should be given after meals in small doses. It may also be rubbed into the armpits, and a flannel moistened with some of it may be worn over the abdomen. The best preparation of iron is steel wine, but others are useful, especially the tartrate, ammonio-citrate, syrup of the phosphate or iodide, or Parrish's food. Chalybeate waters are also of service. Sometimes it is advisable to combine quinine with the iron.

When any inflammation arises in rickety children, lowering measures are not borne, but supporting treatment is indicated. Laryngismus requires tonics and baths. The slightest sign of bronchial catarrh ought to receive immediate attention, as rickets renders this complaint extremely dangerous, while it aids materially in producing deformity of the chest.

CHAPTER XXXIII.

CONSTITUTIONAL SYPHILIS.

In the present chapter it is not intended to give a full description of syphilis, but merely to sketch an outline of the course of the affection

as it results from *direct inoculation*, with the constitutional effects thus induced, and to consider the phenomena presented by *congenital syphilis*.

Syphilis from Direct Inoculation.—Syphilis is classed by many along with the specific fevers, the differences observed being supposed to be due to its more prolonged course. As a primary disease it can only be transmitted from one individual to another by *direct inoculation* or *contact*. This produces a *specific sore*, having an indurated base, with but little tendency to suppuration, the neighboring lymphatic glands being also hard and somewhat enlarged. Then follows a *period of incubation*, of from one to three months' duration, at the close of which *secondary symptoms* arise. These are preceded and accompanied by some general disturbance, indicated by languor, pains in the bones and joints, especially at night, debility and loss of flesh, slight pyrexia, impaired digestion, and tendency to anæmia. The secondary symptoms consist of: 1. A cutaneous eruption, of very variable character, being either a mere rash, papular, scaly, vesicular, pustular, bullous, or tubercular. It usually presents a coppery tint, and is most marked in the bends of the limbs. 2. Ulceration of both tonsils, the ulcers being gray, abruptly cut, scarcely painful, and without any tendency to spread. 3. Enlargement of the glands of the neck, especially behind. 4. Superficial inflammation of the mucous membrane of the mouth, tongue, palate, pharynx, or larynx, sometimes with slight ulceration. 5. Mucous tubercles or condylomata in connection with the tongue, angles of the mouth, pharynx, larynx, anus, penis, labia, and other parts. 6. Loss of the hair, which becomes dry and thin. 7. Onychia. 8. Iritis or retinitis, these being rather late phenomena. 9. Slight and transient periostitis, especially on the cranium. More or less of these morbid conditions may be present, and this stage lasts from six to twelve months usually, but may in rare instances extend to eighteen months or longer. Secondary lesions show a remarkable tendency to symmetry.

After this succeeds a period differing greatly in duration in different cases, during which there are either no symptoms at all, or only occasional slight cutaneous eruptions, or little ulcers on the tongue or lip. This interval is in many cases followed by *tertiary symptoms* or *sequelæ*. The chief pathological tendencies of tertiary syphilis are to produce certain lowly organized growths of the nature of fibro-plastic, fibro-nuclear, or fibroid tissue, which are prone to suppuration and ulceration.

Many growths are met with in tertiary syphilis which are merely proliferations of ordinary connective or fibrous tissue, and present the same characters, but those which are peculiar to syphilis constitute what are termed *gummy tumors* or *gummata*; there is, however, no marked line of demarcation between these, both often existing together,

and the former becoming converted into the latter. Gummata are not of the nature of an exudation, but result from hyperplasia of the connective-tissue elements previously existing, beginning in the walls of the vessels, the new elements invading the normal tissues and being mixed up with or displacing them. At first they are soft, translucent, grayish-white, almost homogeneous; but afterwards they become firmer, tough, yellowish, opaque, non-vascular, and caseous-looking, owing to degeneration and gradual drying up. On section they often present a central yellowish mass, or several spots surrounded by a translucent fibrous layer, which sometimes look like a capsule, but this cannot be separated from the surrounding tissues, into which it gradually passes. Gummata vary much in size, and some of the larger masses seem to be formed by the union of smaller nodules. In structure they resemble at first granulation-tissue or embryonic connective tissue, consisting of an amorphous matrix, with minute spherical or ovoid finely-granular cells inclosing obscure nuclei. This matrix becomes fibrillated more or less, while many of the young elements degenerate and ultimately break down into mere granules of fat and cholesterin, which are imbedded in a small amount of fibrillated stroma. These several stages may be seen in the same growth, the central yellowish portion of the nodule being that which is most advanced. A few vessels are present in the recently formed tissue, but these afterward disappear.

These growths may be absorbed more or less completely, or their fibrous stroma may be left, which tends to shrink, giving rise to deep cicatrices or seams; in certain structures they are liable to suppurate or ulcerate. Several tissues and organs are often affected at the same time, this being one of the great characteristics of syphilitic deposits.

The chief morbid conditions which are liable to be met with in *tertiary syphilis* may be enumerated as follows: 1. Skin-eruptions and ulcerations, viz., erythema and psoriasis of the hands and feet; ulceration from tubercles, subcutaneous gummata, or syphilitic lupus. These ulcers are horseshoe or kidney-shaped, and spread in a serpiginous manner. 2. Ulceration of the pharynx and palate. The ulcer may commence at any point, often starting in two or more places. It is unsymmetrical, spreads very irregularly and deeply, causing much destruction of tissue, and forming an excavation with hard borders. It often extends to the larynx, thus inducing very dangerous symptoms; or may even reach the œsophagus. When cicatrization takes place, there is often much induration and contraction, which may lead to obstruction. 3. Induration of the tongue, followed by hard, well-defined, unhealthy, painful ulcers. 4. Ulceration of the rectum occasionally, accompanied with dysenteric symptoms, and very apt to be followed by stricture. 5. Growths in or ulceration of the larynx, the latter almost always beginning on the epiglottis, and presenting the usual char-

acters. The cicatrix following a syphilitic ulcer here is firm, pink, shining, retracted, and surrounded with growths, hence causing serious interference with breathing. The cartilages often necrose. 6. Fibroid thickening of the trachea and larger bronchi, leading to diminution of their calibre. 7. Gummata in the subcutaneous tissue or "cellular nodes," most frequent among females, and generally observed on the legs, being single or multiple. They finally form ulcers. 8. Inflammation of a bursa, especially that over the patella, followed by ulceration. 9. Gummata in the voluntary muscles, often forming indurated tumors. 10. Periostitis and disease of the bones. Periosteal nodes form chiefly over the tibia and skull, sometimes in large numbers, but they may be observed over almost any bone. They are usually attended with severe pain, especially at night, and feel very sore and tender. They may undergo absorption, ossification, fibrous development, suppuration, or may become truly gummatous. Bones are often carious or necrosed, portions being exfoliated and leading to much destruction of tissues. This is not uncommonly seen about the nose, palate, and skull, and may originate intercranial inflammation. I have met with several instances of syphilitic caries of the ribs, leading to pleurisy. Syphilitic caries presents a peculiar worm-eaten appearance. 11. Enlargements of the testicle, due to gummata. 12. Chronic enlargement of the lymphatic glands, with but very slight tendency to suppuration. 13. Gummata or fibrous growths in the internal organs, especially the liver and nervous centres; or not unfrequently albuminoid disease and fatty degeneration. 14. Growths in the placenta, leading to abortion or miscarriage, which may also happen from the direct effects of the syphilitic poison on the ovum.

These different morbid changes are accompanied with more or less constitutional cachexia, and they necessarily give rise to local symptoms according to the part affected. In tertiary syphilis the lesions present no tendency to symmetry.

Congenital or Hereditary Syphilis.—Syphilis in the infant is occasionally evident at birth, and various internal lesions may be developed while in utero; but more commonly the disease is not manifested before from three weeks to a month or two after birth, very rarely as late as six months. The appearance of the child is usually highly characteristic. There is great emaciation with anæmia, all fat having disappeared, while the muscles feel flabby, the skin hangs in loose folds, and growth is retarded. The face has a peculiar shrivelled, aged, decrepit look, which is particularly seen when the child cries, being also dark, opaque, earthy or muddy-looking. The nose is often broad or depressed. The entire skin feels dry, harsh, rough, and inelastic, and the cuticle desquamates. Various cutaneous eruptions are liable to break out, which tend to be moist; among the most frequent is a dull red or coppery, shining, erythematous condition of the palms and soles; of the

surface around the anus; and of the thighs and genitals. Roseola, lichen, psoriasis, eczema, impetigo, ecthyma, or pemphigus may be observed. Small yellowish patches sometimes form on the skin, like hard scales, which on separating leave superficial ulcers. The hair is often very deficient, and the nails grow slowly, while they are prone to ulceration. The mucous membranes are either inflamed, or the seat of tubercles or condylomata, or ulcerated. The mouth is hot and swollen, and the lips fissured. Among the most characteristic phenomena are a peculiar hoarse cracked cry; and snuffing, with nasal discharge, which tends to clog the nostrils and interfere with breathing. Ulcers may be visible about the nose, angles of the mouth, lips, throat, anus, or labia. Mucous tubercles are frequently observed about the mouth and anus, on the labia sometimes or scrotum, near the umbilicus, or in the larynx. Condylomata are occasionally present. Discharges from the eyelids or ears are not uncommon. Occasionally iritis or some other inflammatory affection of the eye is set up. Syphilitic children are more liable to serous inflammations than others. Nodes very rarely appear, but are apt to be numerous when they do form. The internal organs may be affected. In exceptional cases there are well-marked evidences of congenital syphilis without any particular emaciation or anæmia.

Mr. Hutchinson calls attention to some important distinctions between *congenital* and ordinary *constitutional* syphilis. He states that in the former the secondary and tertiary phenomena sometimes occur together, but the secondary are not then well marked; as a rule, however, there is a considerable interval between them, the child apparently recovering more or less completely, tertiary symptoms not setting in until between five years of age and the time of puberty or even later. In the meantime the health may be good, but the appearance is hardly ever satisfactory, while growth and development are sometimes much retarded. As special secondary symptoms, he mentions diffuse stomatitis without ulcers, and diffuse inflammation of the mucous membrane of the nares; among tertiary symptoms a form of phagedenic lupus, and interstitial inflammation of the cornea or keratitis. Deafness and amaurosis are also stated to be far more common in the inherited disease, but paralysis of single nerves is not observed. Another point of difference is that in all its stages congenital syphilis tends to exhibit symmetry.

The teeth are sometimes very peculiar in congenital syphilis. The incisors of the temporary set are cut early, but are of bad color and crumble away speedily, especially the upper central. The same teeth of the permanent set are of a bad color; short, narrow, peggy, and deformed; rounded at the angles; separated by an interval, or turned towards each other; the edges being jagged or having a vertical notch, with sometimes a shallow groove running up to the gum in front and behind. The canines may be similarly affected.

It has been suggested that the virulent character which scarlatina sometimes assumes in individuals or in families during a mild epidemic, may be the result of a syphilitic taint.

There are certain important points bearing upon the transmission of syphilis to which it is necessary to allude. It seems certain that the disease may be communicated to the mother through the fœtus, usually only tertiary symptoms being then produced, and these are not severe. There is reason to believe that it may be transmitted to a third generation. Probably it may be originated by the milk of a syphilitic nurse; and some believe that on the other hand a syphilitic child may infect the nurse.

DIAGNOSIS.—It is only intended here to offer a few remarks respecting the general diagnosis of constitutional syphilis, whether resulting from inoculation or hereditary transmission. The possibility of the existence of a syphilitic taint should always be borne in mind, and in any doubtful case it is requisite to make rigid investigation in order to clear up this point. If direct information cannot be obtained, it may often be procured indirectly by inquiring about the ordinary secondary and tertiary symptoms of syphilis, such as sore throat, rash, etc. Examination of the throat, mouth, tongue, eyes, or over the tibiae or skull, may give evidence of past or present disease, in the form of cicatrices, iritic adhesions, nodes, and other lesions. The existence of paralysis of a single nerve, especially one of the cranial nerves, is strongly indicative of acquired syphilis. Nocturnal pain is also a suspicious sign. In not a few cases the effects of treatment give evidence of the presence of the disease.

Inherited syphilis may in many instances be recognized at an advanced period by pallor and an unhealthy aspect; arrest of growth or development; a sunken bridge of the nose; the peculiar teeth or the early loss of the temporary set; pits and scars or even actual ulcers on the skin, about the angles of the mouth, or in other parts; keratitis or its remains; double deafness without otorrhœa; amaurosis; periosteal nodes or their remains; a very prominent forehead, resulting from meningitis.

TREATMENT.—For constitutional syphilis the two great remedies are mercury and iodide of potassium, the former being especially valuable during the secondary stage, the latter during the tertiary. Mercury may be introduced into the system by the mouth, by inunction, or by the bath, and it is in many cases requisite to bring the patient rapidly under its influence, of course due care being taken to prevent any injurious effects. Calomel, blue pill, and bichloride or iodide of mercury are the forms in which it is usually administered, and the iodide is often very beneficially combined with iodide of potassium in the later stages. Local applications of mercurial ointment or black-wash are valuable in many cases.

Iodide of potassium should be given at first in doses of five grains three times a day, and then gradually increased to ten, fifteen, twenty, or even thirty grains in some instances. When this drug cannot be borne in such large quantities, it has been found that great benefit may be derived from its administration in very small doses. It is often usefully combined with decoction of cinchona and ammonia.

Congenital syphilis decidedly requires mercury. It may be given in the form of hyd. c. cræta, gr. $\frac{1}{2}$ ter die; or the ointment may be rubbed into the armpits and the thighs; or the milk may be used to convey it, blue pill being given to the mother or nurse, or the milk of a mercurialized goat being employed. At the same time all hygienic conditions must be carefully attended to, and the child properly fed. Cleanliness is essential, and simple local applications are often necessary, or black-wash may be needed. Toilet powder should be freely used over the seat of eruption. The use of cod-liver oil, either internally or by inunction, is frequently attended with benefit.

In the advanced stage of congenital syphilis mercury often disagrees seriously, and at the early stage it sometimes cannot be given. Iodide of potassium must then be substituted.

CHAPTER XXXIV.

TUBERCULOSIS—SCROFULOSIS.

VARIOUS questions connected with tuberculosis and tubercle remain still very unsettled, and many observers are engaged in endeavoring to elucidate them. All that can be aimed at in this work is to give a brief general summary of the present state of knowledge and opinion on the subject, deduced mainly from the results of microscopic research and experiments upon animals.

Many believe in the identity of the scrofulous and tubercular diseases; others consider them as entirely distinct.

ETIOLOGY.—Looking upon tuberculosis as a constitutional disease, it has almost universally been considered hereditary. Undoubtedly various forms of tubercular disease run in families, but many pathologists think that only a constitutional debility is transmitted, with a tendency to low inflammations, the products of which rapidly become caseous and may thus lead to tubercle. This is the view strongly expressed by Niemeyer, and he believed that the same result would follow in the case of children born of parents debilitated from any cause. Occasionally tubercle is congenital. Intermarriages, very early marriages,

and advanced age of the father have been set down as causes of inherited tuberculosis. Syphilis in the parent has probably considerable influence in its development.

Age materially affects both the development of tubercle and its seat. It is by far most frequent among children and young persons. Most deaths occur from twenty to thirty years of age. In children the disease tends to involve a number of organs; in adults it is more localized. The glandular system is very frequently affected in the former.

A number of causes which tend to lower the state of general health act as important predisposing causes of tuberculosis, or of the local development of tubercle. Among these may be specially enumerated imperfect ventilation, want of fresh air, and close confinement; overcrowding; want of exercise; constant residence in a humid atmosphere; unhealthy, insufficient, or indigestible food, including the milk of mother or nurse; intemperance; interference with the free expansion of the chest, due to clothing or occupation; previous diseases, such as measles, whooping-cough, fevers, as well as many chronic diseases; long-continued dyspepsia; prolonged lactation; excessive sexual indulgence; excessive mental labor and depressing passions. Many of these are frequently found acting in concert, especially among the poor and hard-worked inhabitants of large towns. Imperfect hygienic conditions and improper diet are particularly liable to affect children injuriously.

It is believed by some that tuberculosis is infectious through the medium of the breath and exhalations, but there is no adequate foundation for this idea. Nor is there any reason to suppose that the disease is transmitted by vaccination.

ANATOMICAL CHARACTERS.—The typical form of true tubercle almost universally recognized at the present day consists of certain minute bodies, termed *gray granulations* or *miliary tubercles*. These appear as small nodules or granulations about the size of a mustard or millet seed, generally roundish but sometimes slightly angular, well defined, firm, of a grayish-white or pearly-gray color, more or less translucent, and non-vascular. These may be quite separate and distinct, or collected into irregular groups, their individual outline being then rendered indistinct. In some structures, however, tubercle is more diffused, and appears as a grayish *infiltration*, which presents a smooth and dense section; but many so-called tubercular infiltrations are probably inflammatory in their origin. In its earliest stage tubercle is not visible to the naked eye, and it is by continued growth and agglomeration of fresh tubercles that it becomes perceptible, appearing either as granulations or infiltrations according to their mode of arrangement.

What has been described as *yellow tubercle* is nothing but nodules or masses of caseous matter, derived either from tubercle or from various inflammatory and other morbid materials which have undergone cheesy degeneration. True tubercle may be mixed with this material; while

it also tends to excite inflammation around, and thus its physical characters may be more or less modified.

Microscopic Structure.—Tubercle may be described as consisting of the following histological elements: 1. Lymphoid corpuscles, which are very small, round, colorless, translucent, and slightly granular, each containing a single nucleus. 2. Epithelioid cells, of larger size, very delicate, and hence liable to rupture and set their nuclei free. 3. A giant-cell, which consists of a mass of finely granular protoplasm of very varied form, often presenting processes at its margin, and having imbedded in it a great number of nuclei, chiefly at its periphery and sometimes regularly arranged. 4. Free nuclei. 5. An intercellular substance, which may be either amorphous, homogeneous, and hyaline; granular; or in the form of a fine reticulum or network of delicate fibres. There is much difference of opinion among observers as to the presence, arrangement, and relative proportion of these elements. The lymphoid cells are generally considered to be most abundant, but Schüppel describes tubercle as being made up chiefly of epithelioid elements surrounding the giant-cell. This giant-cell has attracted much attention of late years. It occupies the centre of each tubercle and great importance was attached to it by Schüppel and others, but Friedlander has since shown that it is found in many healthy and morbid products, as well as in tubercle. Tubercle has been distinguished by some writers as cellular and fibrous, according to the proportion of cells and fibrous reticulum entering into its formation. Friedlander, however, insists that in recent tubercle no fibres are visible, and that the appearance is due to the hardening processes employed in its preparation for microscopic examination. Tubercle does not contain any vessels or lymphatics of its own, but it may involve those belonging to the original tissue, and also pigmentary matters. As tubercle undergoes degenerative changes its microscopic appearances alter materially.

Changes and Terminations.—Some very important changes are liable to take place in connection with tubercle. 1. *Absorption.*—It is probable that tubercle may be absorbed after it has undergone degenerative changes. 2. *Caseous degeneration.*—The want of vitality of tubercle renders it very liable to this change. The process begins in the centre of the granulations, causing them to become yellow and opaque. Ultimately the material often becomes so softened as to be converted into a purulent or curdy-looking fluid, simulating an abscess; or a firm cheesy mass is produced, which may become encapsuled. As the cheesy degeneration proceeds, the microscopic appearances alter, the cells shrivelling and breaking up, while granules, oil-particles, and cholesterin appear in abundance, finally nothing but a granular debris remaining. 3. *Calcification.*—This frequently follows caseation, the substance consequently becoming inert. Sometimes the calcareous matter is subsequently discharged, or is surrounded with a fibrous

capsule. 4. *Elimination and its results.*—After the process of softening has been completed, the material is often eliminated, thus giving rise to ulcers on mucous membranes, and cavities in organs, as is well exemplified in the case of the intestines and lungs. These may ultimately heal up and a permanent cure result, the cicatricial tissue formed being very prone to contract. More commonly, however, the destructive process extends, owing to the formation of fresh tubercles on the walls of the ulcer or cavity. Occasionally a cavity results from the death and discharge of a quantity of tubercle *en masse*. 5. *Fibroid change.*—There is sometimes an increase of the fibrillated stroma, perhaps more frequently than is generally believed, coincident with a disappearance of the cells, and finally the granulation may consist almost entirely of fibrous tissue, becoming dense and hard. This is probably identical with the change which has been described as *cornification* or *obsolescence*, in which tubercle becomes opaque, horny, and bluish-gray.

Tissues and Organs Affected.—Lymphadenoid tissues are specially prone to tubercle, but it may involve any of the connective tissues. Several organs or structures may be affected at the same time, but in adults tubercle is often confined to one organ. In most cases of acute tuberculosis gray granulations are seen throughout almost every organ in the body. Parts actively growing are chiefly implicated. The most frequent seats of tubercle are the lungs and respiratory passages, bronchial, mesenteric, and other glands, small intestines, pleura, peritoneum, and pericardium, pia mater, and spleen. It is not uncommon in the kidneys and genito-urinary passages, testes, brain, and spinal cord. In other parts it is rare. Tubercle has been described in connection with morbid products, such as scrofulous ulcers, chancres, and cancers. Louis laid it down as a law, that if tubercle is found after fifteen in any part of the body it is certain to be present in the lungs.

PATHOLOGY.—Until within a comparatively recent period tubercle was almost universally regarded as a specific exudation from the blood, at first fluid, but soon coagulating into a molecular blastema, the molecules aggregating together to form cells. This view is not yet extinct, though the researches of late years have satisfactorily proved that it is quite incorrect. Observers, however, are by no means agreed as to the nature and mode of development of tubercle. Some still consider that many of its cells at any rate come directly from the blood, being of the nature of leucocytes; others regard them as being the result of retrograde metamorphosis of pre-existing tissue elements or morbid products. Virchow and his followers believe that tubercle arises from proliferation of the fixed corpuscles of the connective tissues. On account of its structure, which resembles that of lymphatic tissue, tubercle has been regarded as of this nature, and as being merely the

result of a hyperplasia or excessive growth of pre-existing adenoid or lymphatic tissue. This is the view strongly maintained by Burdon Sanderson, and one which has found much favor. It is supported by the fact that adenoid tissue is usually very extensively distributed, having been discovered in the perivascular sheaths of the small arteries in various parts, beneath the epithelium of serous membranes, around the minute bronchia, under the mucous membrane of the alimentary canal, in the spleen and other glands, beneath the conjunctiva, and in other parts. In the perivascular sheaths of the arteries tubercle is described as being very common, the cells increasing at separate points so as to compress or even ultimately to close the vessels.

More recent investigators have described tubercle as originating in lymphatic vessels themselves, by a metamorphosis of their endothelium and outer tissues; around the lymphatics, as the result of a perilymphangitis; or in connection with the small bloodvessels. Rindfleisch believes that the lymphoid cells are derived from the endothelium of bloodvessels and lymphatics; the epithelium of serous membranes, the lungs, and kidneys, and the muscular tissue of the bronchia. Others deny that tubercle can arise from epithelium or muscular elements. The formation of the giant-cell has received much attention. Schüppel described it as originating in changes in a small bloodvessel. It has also been attributed to alterations in the endothelium of the vessels, and to aggregation of leucocytes. Klein, whose recent researches into the nature of tubercle are highly important, affirms that in the lungs he has followed the development of giant-cells from the epithelial cells of the alveoli with all possible certainty.

Another pathological question relating to tubercle has reference to its mode of origin or causation. The chief views held on this point may be stated as follows:

1. That tubercle is merely the local development of a peculiar constitutional diathesis, either hereditary or acquired, to which the term *tuberculosis* is applied.

2. That it may originate from some direct local irritation under certain circumstances, in structures where lymphatic tissues exist, quite apart from any constitutional condition.

3. That it is the product of an infectious disease, being the secondary result of the absorption of cheesy morbid products into the blood, which somehow act as a poison and give rise to a specific inflammation. This view was first advanced by Buhl, and experiments performed upon living animals by Villemin, Lebert, Wilson Fox, Waldenburgh, Clark, Burdon Sanderson, Cohnheim, Feltz, Chauveau, and others, have shown that bodies resembling miliary tubercles can be artificially produced in the lungs, glands, and other organs of animals, especially the guinea-pig. This has been effected by the inoculation of tubercular matter under the skin, as well as of various other cheesy morbid products;

by the insertion of putrid meat; by putting a seton in the skin, or even causing a simple wound; by injecting cheesy matter into the serous cavities, bronchia, bloodvessels, or heart; and even by feeding animals on caseous tubercle. These artificial tubercles are associated with very numerous inflammatory growths, which rapidly become caseous. These experiments give weight to the infective theory, but some deny that the morbid appearances thus produced have any analogy with tubercule.

Acute general tuberculosis not unfrequently follows some local lesion, especially where caseous matter exists. The same is often true of localized tubercle, as for instance when it is developed in the lungs or lymphatic glands. Niemeyer was of opinion that caseous matter generates tubercle by a local rather than a general infection. The primary channels by which infection is generally supposed to be conveyed are the lymphatics, by means of which the morbid materials may be carried into the blood, being then distributed through the body.

SYMPTOMS.—Much difference of opinion has always prevailed as to whether there is a true *tubercular diathesis*, indicated by any characteristic signs. Many persons become tuberculous who present no evident peculiarities, but the following characters are looked upon as showing a tendency to the disease in children and young persons. They are tall, slim, erect, and delicate-looking, with scarcely any fat, and have usually a pretty oval face, a clear complexion, bright eyes, and large pupils. The skin is very thin, soft, and delicate, and through it bluish veins are seen; the hair is fine and silky, often light, the eyelashes being long. They cut their teeth early, and are generally precocious and clever, walking and talking soon. They are excitable and active in body and mind. The ends of the bones are very small and firm, the shafts also being thin and rigid, while the cartilages seem very soft and flexible. The thorax is small, being either long and narrow, or flattened.

The *scrofulous* or *strumous diathesis* is characterized as follows: The body is short, thick-set, and heavy; the face plain, tumid-looking, with expanded and thick *alæ nasi*, a low forehead, a large upper lip, and a dull, pasty complexion. The skin is thick and opaque, and is very subject to obstinate eruptions of a moist character, with a tendency to the formation of scabs. Chronic abscesses or exudations are also liable to form in the subcutaneous tissues. Scrofulous children often exhibit the phlegmatic temperament, are inactive and languid in mind and body, as well as backward in intellect, this being evident in their expression. The bones are thick, with rather large ends, and are liable to caries or necrosis. Chronic disease of the joints is also common. The teeth often decay early. Derangements of the alimentary canal are frequent, and the belly is generally tumid. The lymphatic glands usually exhibit marked changes. They become enlarged chronically,

the enlargement having been attributed to chronic inflammation, hyperplasia of the normal tissues, or the actual development of tubercle; and this is very apt to end in caseous degeneration, or slow and unhealthy suppuration. Unhealthy inflammation of mucous membranes is very frequent, the products being rich in cells and of a sticky character, while the membrane itself is the seat of an exudation containing abundant cells; it often ends in ulceration. Ophthalmia, tinea tarsi, ozæna, otitis, with otorrhœa, throat-catarrh, and catarrh or more serious inflammation of the alimentary or respiratory mucous tracts, are common. Scrofulous individuals are very liable to the development of tubercle. They may be the subjects of pyelitis, cystitis, or catarrh of the vagina or vulva.

The local development of tubercle as a chronic disease is attended with corresponding local symptoms; as well as with much general disturbance as a rule, in the way of fever, emaciation, debility, anæmia, night-sweats, etc. These will be more particularly considered when treating of the individual diseases of organs.

ACUTE TUBERCULOSIS.—It is necessary briefly to allude to the symptoms which are associated with the deposit of tubercle as an acute affection. Generally almost all the organs in the body are involved under these circumstances, but only the lungs and brain usually reveal any local signs, and these are often very obscure.

Three forms of acute tuberculosis have been described, the *insidious*, *acute febrile*, and *adynamic*, but all grades are met with, and the duration and course of the disease are very variable. At first there may be merely languor, heaviness, irritability, or restlessness; derangement of the digestive organs, with offensive stools; irregular fever, the temperature being sometimes very high; and rapid wasting. Or repeated rigors occur, followed by high fever, with an extremely rapid pulse, much constitutional disturbance and prostration, and profuse sweating. Head symptoms are severe, and there is a great tendency towards typhoid symptoms, such as a dry brown tongue, sordes, and a feeble pulse. Breathing is very hurried, and there may be some cough, but no marked physical signs can be detected in the lungs. Ultimately evidences of the presence of tubercle in certain structures often appear, in the form of tubercular meningitis, peritonitis, and other lesions.

DIAGNOSIS.—It is always important to recognize any tendency to tubercular disease when it exists, especially in young persons, and this depends upon an acquaintance with the family history, as well as upon what the examination of the patient reveals. The diagnosis of local tubercle rests upon the presence of local signs along with constitutional symptoms.

Acute tuberculosis is by no means always easy to diagnose; it may closely resemble fevers, especially typhoid. It should always be remembered in obscure cases occurring amongst children. The absence of

the peculiar symptoms of the fevers or of any eruption; the range of temperature; extreme frequency of the pulse; very quick breathing; severe and rapid course; and local symptoms present, will usually enable the diagnosis to be made.

PROGNOSIS.—The existence of a distinct tuberculous or strumous diathesis is a serious matter. The prognosis of its local development will depend upon the seat and extent of the mischief, and various other circumstances. Acute tuberculosis is an extremely grave condition, being almost always fatal.

TREATMENT.—When there is any tendency to tubercle all hygienic conditions should be rigidly attended to. Fresh air and sunlight; proper exercise; warm clothing; change to the seaside, with salt-water baths; nutritious diet carefully regulated, with plenty of good milk; and the avoidance of undue mental labor, are the chief things required. The digestive organs must be kept in order, and all sources of irritation in connection with them at once removed. Every cause likely to lead to lung-affections must be carefully avoided, and it will be well to examine the chest from time to time, and to treat the slightest pulmonary complaint immediately. Cod-liver oil, iron in various forms, especially steel wine, and tonics properly administered, do a great deal of good in these cases. The treatment of local deposits will be considered in future chapters. In acute tuberculosis nothing is of much avail, but quinine in full doses, cold externally, and ice to the head might be tried, with supporting diet and stimulants.

CHAPTER XXXV.

CARCINOMA—CANCER—MALIGNANT DISEASE.

CANCER is a constitutional affection attended with the formation of new growths of a malignant nature. Though mainly a surgical disease, yet it not uncommonly comes under the observation of the physician, and therefore a brief general consideration of the subject is necessary in this work.

ETIOLOGY.—Cancer is decidedly a hereditary disease. Age exercises a marked influence upon its occurrence, nature, and seat. It is rare in the young, being far most common after middle life, and the mortality from this disease increases as age advances. In early life the softer varieties are met with, and the lymphatic glands are liable to be involved. Primary cancer is chiefly observed in organs which have been functionally very active, but whose functions have ceased to be performed. Women suffer more than men, on account of the frequency

with which the uterus and mammæ are attacked. The digestive organs, bones, and skin are most affected in males. Anxiety, mental distress, and a depressing climate seem to act as predisposing causes.

Injury, excessive use of a part, or some other irritation, may act as the *exciting cause* of a local growth; and some pathologists consider cancer as essentially local in its origin.

ANATOMICAL CHARACTERS.—Different classifications have been made of the forms of cancer, but they may all be arranged under the following varieties: 1. *Scirrhus*. 2. *Encephaloid*. 3. *Colloid*. 4. *Epithelioma*. Each of these requires separate consideration.

1. *Scirrhus, Fibrous, or Hard Cancer*.—This variety either infiltrates tissues or forms distinct tumors, which are irregular, but never of very large size. The growth is often depressed, and causes puckering of overlying structures. The consistence is very hard and firm, sometimes approaching that of cartilage. A section is gray, bluish-white, or whitish, and glistening, while opaque fibrous bands are seen intersecting it. There is very little vascularity. The outer part of the growth is less dense, and yields a milky juice on scraping.

2. *Encephaloid, Medullary, or Soft Cancer*.—Assuming the form of tumors, or being infiltrated, encephaloid increases with great rapidity, forming considerable masses, which are more or less lobulated. The substance is soft and brain-like, and on section presents a pulpy appearance, especially towards the centre, varying in color from white to crimson, according to its degree of vascularity, and not uncommonly presenting small extravasations of blood. A large quantity of juice can be expressed. This form of cancer may produce very vascular fungous growths, then called “fungus hæmatodes,” and all grades are met with between it and scirrhus.

3. *Colloid, Alveolar, or Gelatiniform*.—Many consider this variety as merely one of the other forms which has undergone colloid degeneration. It generally infiltrates, but sometimes forms lobulated masses, which have a tolerably firm, uniform consistence. On section roundish spaces or alveoli are seen, having fibrous walls and containing the colloid substance, which is of more or less glue-like consistence, glistening and translucent in appearance, either colorless or grayish-yellow.

4. *Epithelioma, Epithelial Cancer, or Cancroid*.—Generally observed in connection with the skin or a mucous membrane, epithelioma commences either as a hard nodule, or as a small excoriation or ulcer. The latter has indurated edges, with an irregular, gray, or bloody surface, which is often papillated and villous, or nodulated. The consistence is generally firm, but may be soft and friable. The cut surface is grayish-white, or presents numerous opaque specks and white lines of fibrous tissue; a small quantity of milky granular fluid can be expressed, which will not mix with water.

Other varieties of cancer are described as *melanotic*, which contains

much pigment, being most commonly encephaloid; *cystic*, where cysts are developed; *chondroid*; *osteoid* or bony; and *villous*, which affects mucous surfaces, presenting villous processes.

Structure.—All the cancers consist of cells inclosed in the meshes of a fibrous stroma, these varying greatly in their proportions in the different forms. The cells are of large but very variable size; present diverse and curious forms; and contain one or more nuclei with nucleoli, as well as usually a greater or less number of fat-molecules. Each nucleus is large, clear, and well-defined, eccentric, round or oval in shape, and incloses one or more nucleoli. Often abundant free nuclei are present. The expressed juice contains a quantity of these cells, nuclei, and granules. The stroma is generally firm and fibrous, the fibres being either delicate or coarse; but if it has rapidly developed, it presents an embryonic structure. In it the vessels are solely distributed, and its fibrous bundles intersect in all directions, forming a communicating network, within the alveoli of which the cells are grouped. Lymphatics have been found accompanying the bloodvessels, and they communicate with the alveoli.

In scirrhus the cells, though they may be abundant at first, speedily disappear, and the fibrous stroma is greatly in excess, especially towards the centre of the growth, where finally no cells at all can be discovered. In encephaloid, on the other hand, the cells are greatly in excess, develop rapidly and as speedily degenerate, becoming granular and the nuclei being set free. There is but little stroma, which is soft, delicate, and very vascular. Colloid is in great part structureless, but some cells are present, large and spherical, often having a lamellar outline, and containing some of the colloid material. Epithelioma presents generally a large number of cells, which, with few exceptions, are exceedingly like those of squamous epithelium, but are subject to great alterations in shape from mutual pressure. They tend to form peculiar concentric globes or nests, increasing from within, so that the outer layers are hardened and flattened. Ultimately the entire groups may become dry, firm, and brownish-yellow. A variable amount of stroma is present.

Cancerous growths are very liable to fatty degeneration, especially the softer forms, and as a result the cells become more granular and softening takes place, or parts of the growth may assume a caseous appearance. Calcification is very uncommon. Melanosis and colloid are generally considered as forms of cancer which have undergone these peculiar degenerations. All cancers tend to ulcerate, the ulcers having no disposition to heal, but being on the other hand inclined to spread.

Organs and Tissues Affected.—Scirrhus is usually observed in the mammary gland, uterus, stomach, rectum, or skin. Encephaloid affects chiefly the bones, testicles, eyes, and internal organs, especially the

lungs, liver, kidneys, brain, and spleen. Colloid particularly involves the stomach, but is sometimes seen in the omentum, intestines, and other parts. Epithelioma grows in connection with the skin or a mucous surface, but by extension may invade upon any tissue. Its ordinary sites are the lower lip, the tongue, eyelids, cheeks, scrotum, prepuce, labia, uterus, or bladder. In exceptional cases internal organs are involved.

Several parts may be attacked, either simultaneously or usually in succession. In the latter case the original deposit is said to be *primary*, and those which follow are named *secondary*. Secondary deposits are frequent in internal organs, and are generally of the same variety as the primary growth, but scirrhus is often followed by encephaloid in internal organs. Malignant growths show a marked tendency to spread and to infiltrate surrounding tissues, so that no line of demarcation is observed; in rare instances a kind of capsule forms.

PATHOLOGY.—Two very opposite views are entertained as to the origin of cancer, viz.: 1. That it is primarily a constitutional or blood-disease or cachexia, of which the formation of malignant growths is but a local manifestation. 2. That it is in the first place a local disorder, produced by some irritation; and that the blood is only changed secondarily, as the result of absorption of morbid materials from the local formation. It is not at all improbable that both these theories are correct in different cases. Secondary growths arise in consequence of absorption by the bloodvessels and lymphatics, by which the cancerous matter is conveyed to distant parts, especially those more immediately associated with the structure first affected; neighboring absorbent glands are very liable to be involved.

The stroma of cancer consists partly of the original cellular tissue, but is chiefly derived from hyperplasia of the connective-tissue elements. The cells are developed by the proliferation of pre-existing cells; some think they are only derived from epithelial structures, but others believe that they also originate in connective-tissue corpuscles and migrated white blood-corpuscles.

Dr. Creighton in his recent researches respecting malignant tumors has arrived at the following conclusions: In secondary tumors the parenchymatous cells, and not the cells of the connective tissue of the organ, are the elements that undergo transformation. This transformation consists in a vacuolation of the protoplasm of the cells, with other associated changes; the products remaining as tumor-cells or as indifferent cells which may further develop into connective tissue. Vacuolation has been otherwise described as endogenous cell-formation, a mode of cell growth that is essentially heteroplasmic, the products being alien to the original tissue. Both in physiology and pathology it is a familiar process, as for example, in the development of colostrum-cells, spermatozoa, mucous and salivary corpuscles, and the goblet-cells so

abundantly found amongst the epithelium of mucous surfaces; and Dr. Creighton concludes that the process of secretion in the epithelial cells of mucous surfaces is essentially a process of endogenous cell-formation. This being the case, a true physiological basis has been established for the theory of the formation of secondary malignant tumors. The theory may be extended to the origin of primary malignant tumors in epithelial parts, for it is evident that if the epithelium, in the exercise of its function, endogenously produces solid elements instead of fluid substance, the result will be a heteroplastic growth. The growth of the malignant tumors on the mammæ for example may be explained in this way.

Primary and secondary malignant tumors have a distinct genetic relation to each other. The primary precedes the secondary in point of time; a remarkable family likeness can in most instances be traced between them; and, what is of the greatest significance, the process of vacuolation or endogenous cell-growth, by which the secondary tumor is developed, bears a remarkable resemblance to the first changes in the ovum after impregnation. To explain the origin of secondary tumors in a healthy organ, the influence of the primary or parent tumor must manifestly be assumed, an extraneous influence operating by the mechanism of endogenous cell-formation. This influence, Dr. Creighton contends, is comparable to a spermatic influence, which is exercised in some unknown manner by the parent tumor. Dr. Creighton attempted to produce cancer artificially, but without success.

SYMPTOMS.—Cancer usually gives rise to two sets of symptoms, viz., *general* and *local*. The general symptoms may precede the local, and include more or less wasting; a peculiar sallow cachectic look, with a yellowish earthy tint of countenance; a careworn, gloomy expression; debility and languor; anæmia and its accompaniments; with irregular fever. These vary much in their intensity according to the part affected; and the rapidity of the growth and nature of the cancer being most marked in connection with the scirrhus. The local symptoms may be summed up as pain and tenderness or other subjective sensations, often very severe, the pain being frequently of a lancinating or burning character; interference with the functions of the part affected, in many cases of serious moment; symptoms due to pressure upon, or irritation of, neighboring structures; and objective or physical signs afforded by the growth itself. The duration of cases of malignant disease is very variable, but is rarely prolonged, and sometimes they run an acute course.

CHAPTER XXXVI.

DIABETES MELLITUS—GLYCOSURIA.

ETIOLOGY AND PATHOLOGY.—A small quantity of sugar is often temporarily present in the urine under certain circumstances, especially after taking food containing much sugar or starch; after the administration of chloroform; in poisoning by strychnine or woorara; in various conditions which interfere with respiration, such as fits of asthma and hooping-cough; in certain nervous diseases (epilepsy, tetanus, apoplexy, etc.); and in connection with injuries to the nervous system, liver, and other parts. Glycosuria can also be induced experimentally in several ways. In the disease now under consideration, however, the urine permanently contains sugar, generally in large proportion, and in most cases this is accompanied with serious constitutional disorder. Many views have been advanced to explain the pathology of diabetes, but in the present state of knowledge it must be classed as a general or constitutional disease. There is every reason to believe its phenomena are due to some derangement of the so-called glycogenic functions of the liver, though what the exact deviation is, and how it is brought about, are by no means settled points. It seems quite certain that in health an amyloid, fermentable substance, capable of conversion into grape-sugar, and named glycogen or animal or hepatic dextrin or starch, is formed in the liver. It is also proved that a peculiar ferment exists in the blood capable of converting this into sugar. One class of physiologists believe that in the normal state this conversion is constantly taking place in the liver, the sugar passing on into the circulation through the hepatic vein, being gradually oxidized and destroyed in the blood. Another class deny that there is any such change in health, and Dr. McDonnell has advanced the theory that the hepatic dextrin is not converted into sugar at all, but unites with nitrogen to form a new protein-compound resembling casein. Those who hold the first view maintain that diabetes consists either in an increased formation of sugar in the liver, or in a diminished destruction of that normally produced; hence it accumulates in the blood and is excreted by the kidneys. The second class of pathologists are of opinion that under certain conditions the ferment reacts upon the glycogen in the liver, and that this leads to an unnatural production of sugar.

The probability is that the disorder of the hepatic glycogenic function, whatever it may be, can be brought about in several ways. Experiment, as well as clinical and post-mortem examination, has proved

that in many cases it depends upon a morbid condition of certain portions of the nervous system. By irritating or injuring the portion of the sympathetic which sends branches to the liver, certain parts of the spinal cord, or the floor of the fourth ventricle, glycosuria may be induced. It is believed that this nervous disturbance acts through the vessels of the liver, inducing paralysis of their circular muscular fibres, with consequent passive dilatation and congestion, so that the ferment and amyloid matter come into close contact; or that the nerves directly affect the amount of glycogen formed and the rapidity of its conversion into sugar.

The *exciting causes* of diabetes are in many instances by no means clear. Among those to which the disease has been mainly attributed are exposure to wet and cold; drinking cold water when heated; abuse of alcohol, sugar, and starchy substances; strong emotional disturbance or excessive mental work; injuries to the head, spine, and various other parts, or general concussion of the body; organic diseases of the brain and spinal cord. In some cases the disease seems to have followed the prolonged action of depressing mental causes, combined with influences which tend to impair the health, as, for instance, grief and anxiety with long-continued watching over the sick, or worry and close confinement in business. Occasionally it has appeared to be the sequela of some acute febrile disease. Diabetes is most common in adults, from 25 to 65 years of age, especially during the period of development and exercise of the sexual functions; in males, after the period of puberty; and in persons residing in cities and manufacturing districts. In some instances there appears to be some hereditary influence, or the disease tends to run in families.

ANATOMICAL CHARACTERS.—There are no morbid appearances at present recognized as peculiar to diabetes, but the most important lesions observed are those associated with the nervous system. In some cases there is obvious organic disease, such as a tumor affecting the medulla or pons, or pressing upon the sympathetic. In others minute microscopic examination is necessary in order to detect the changes. Dr. Dickinson has described peculiar alterations in various parts of the nerve-centres, especially about the medulla and pons, in the way of dilatation of the arteries, followed by degeneration and destruction of the nerve-elements around them, leading to the formation of excavations, which may be of some size. Most authorities deny that there is any special morbid condition of the liver, though some observers have described certain peculiar changes in its general or microscopic characters. The kidneys are often diseased, but this is a secondary result of the diabetes, the most frequent morbid state being some form of Bright's disease. The lungs are also frequently affected, there being usually some form of phthisis, occasionally pneumonia of a low type or gangrene. The heart is generally small and wanting in tone. There is

a tendency to serous inflammations of a low type; and to inflammation of other structures ending in suppuration or gangrene. Hypertrophy of the pancreas is said to be comparatively frequent. The stomach is generally dilated, its mucous coat thickened and softened, and its muscular coat sometimes hypertrophied.

SYMPTOMS.—Clinically cases of diabetes differ remarkably in their severity, one class presenting but slight symptoms; another being accompanied with marked local and constitutional disturbance. In a typical instance the symptoms may be arranged under the following heads:

1. *Urinary Organs and Urine.*—Micturition becomes more and more frequent, and the urine is increased in quantity. It is irritating in quality, and hence often causes in the male a sense of heat or burning along the urethra, or slight inflammation, excoriation, or even ulceration about the orifice; while in the female the vulva is frequently much irritated. This may lead the patient to indulge in masturbation. Pain and tenderness are often felt over the region of the kidneys. The quantity of urine may amount to eight, twelve, twenty, or even thirty pints in the twenty-four hours; it is usually very pale and bright, the more so in proportion to its quantity; possesses a sweet taste, and occasionally a sweetish odor; has a high specific gravity, generally about 1040, but it may range from 1015 to 1060 or more; ferments rapidly if kept in a warm place, with formation of torulæ, becoming opalescent or depositing a sediment; while it yields more or less sugar to the usual tests, which are described under "Examination of Urine." Many different statements have been made as to the proportion of urea and uric acid present; probably they are as a rule absolutely increased, but relatively to the water diminished. The quantity of water is about equal to that taken in. The amount of sugar is greater after food has been taken, especially such as contains much sugar or starch, being much less when the diet is restricted to animal food. In any pyrexial condition it becomes greatly diminished, or may even be absent altogether. The proportion of sugar usually present ranges from 8 to 12 per cent., and from fifteen to twenty-five ounces are discharged daily on the average; but the quantity may vary from less than an ounce to two pounds or more. The urine may contain albumen and occasionally a little blood; it is also stated to yield fat sometimes, or to resemble chylous urine.

2. *Digestive Organs.*—A very constant symptom of diabetes is insatiable thirst, attended with a dry, parched, and clammy condition of the mouth and throat, due to the presence of sugar in the blood, which creates a demand for much liquid. In many cases also there is excessive appetite, but disinclination for food is not uncommonly observed. The tongue generally presents a peculiar irritable, red, clean, cracked, and dry appearance; it may be moist and furred. Sponginess of the

gums, with tendency to bleed, and rapid destruction of the teeth are frequently noticed. The saliva contains sugar, and is said to be very acid sometimes, owing to the conversion of this into lactic acid. The breath has in some cases a distinctly sweet or ale-like odor. Dyspeptic symptoms are common, such as epigastric fulness or sense of sinking, flatulence, gaseous and acid eructations. As a rule the bowels are constipated, with pale, dry, and spongy stools; but there may be diarrhoea or dysenteric symptoms, especially towards the close.

3. *General Symptoms.*—The aspect of the patient is in many instances strikingly suggestive of diabetes, the prominent characters being emaciation, often extreme, involving not only the fat, but also the muscles, which feel flabby and soft; a peculiar dry, harsh, scurfy condition of the skin; and a distressed, worn, and suffering expression of countenance. The patient feels very weak and languid, often chilly, indisposed for any bodily or mental effort, and complains of pain and soreness in the limbs. Some œdema of the legs is frequently observed, and occasionally dropsy in other parts. Sometimes the temperature is markedly reduced, and in any pyrexial condition it is not nearly so much elevated as it otherwise would be. Sexual inclination and power are commonly greatly diminished or lost. The mental condition and disposition become usually much altered in established cases, as evidenced by decline of mental vigor, disposition to lassitude or drowsiness, lowness of spirits, petulance and irritability, or decline in firmness of character and moral tone. Temporary dimness of vision is not infrequent. The blood contains sugar, which is also found in the various secretions.

4. *Complications.*—Most of the complications of diabetes have been already alluded to in the account of its morbid anatomy, the most frequent symptoms coming under this head being those indicative of phthisis. Here may also be mentioned the not uncommon occurrence of boils and carbuncles, chronic skin affections (psoriasis, etc.), gradual permanent blindness from atrophy of the retina, and cataract, the last being almost always of the soft kind, and attributed to imbibition of sugar, which, it is said, has been detected in the lens.

The precise clinical history of diabetes varies much in different cases, as regards the intensity and exact combination of the symptoms described, and the rapidity of its progress. Ordinarily the course is essentially chronic, the symptoms setting in very insidiously, and becoming gradually but progressively worse. It may be that for a considerable time the advent of diabetes is only indicated by slight general symptoms, such as debility, languor, and some loss of flesh. Occasionally the disease runs an acute course; or it may exhibit remissions from time to time. It is frequently observed that the symptoms are more intense at the early stage than subsequently. Towards the close they often change, the urine and sugar diminishing in quantity,

albuminuria setting in, there being complete disgust for food, and hectic or colliquative diarrhœa occurring. The fatal result usually arises from gradual exhaustion, blood-poisoning, leading to stupor ending in complete coma, or occasionally convulsions, or from complications. Now and then death takes place quite suddenly.

DIAGNOSIS.—When diabetes is well established there ought to be no difficulty in detecting it. The urinary symptoms and characters of the urine, those referable to the alimentary canal, and the general symptoms, are highly characteristic. The rule of always examining the urine carefully when the health is persistently out of order, and especially if there are the slightest symptoms suggestive of this disease, will often lead to a diagnosis at an early period. If a patient complains of much irritation about the external genital organs, or if a child is detected masturbating, diabetes should always be borne in mind. The mere finding of a trace of sugar in the urine is not, however, evidence of the presence of diabetes. It must be in some quantity, persistent, and attended with polyuria. Not often is there any possibility of finding out the exact morbid condition upon which the diabetes depends.

PROGNOSIS.—Confirmed diabetes is a very serious disease, a large proportion of the cases ending fatally, and the average duration is stated to be about from one to three years. In many instances, however, much improvement may be effected; and in some recovery can be brought about. The chief circumstances which influence the prognosis are, age, it being worse in very young than old persons; the general condition of the patient, the disease being much less serious in stout persons; the cause of the complaint and its duration; the amount of sugar and urine passed; the severity of the general symptoms; the presence or absence of complications, as well as their nature; the progress of the case; the results of treatment, and whether this is properly carried out. Any person suffering from diabetes should be particularly cautioned against exposure and other causes of disease.

TREATMENT.—Cases of diabetes must necessarily call for much diversity in their management, but there are certain general principles to be followed, to which attention will now be directed. At the outset it is most important to impress upon patients that they must be prepared to place themselves under strict discipline and guidance, and that upon themselves much of the success of treatment will depend.

1. The first indication almost universally recognized in the treatment of diabetes is regulation of the diet. The object is to prohibit or restrict such articles as contain sugar or starch, especially ordinary bread or flour; sugar in any form; honey; vegetables and fruits containing starch or sugar (potatoes, peas, beans, carrots, turnips, parsnips, strawberries, raspberries, plums, gooseberries, currants, apples, pears, etc.); rice; prepared varieties of starch (sago, macaroni, tapioca, etc.); shell-fish, and the soft parts of crabs and lobsters. Animal food, including

meat, poultry, game and fish, should be the main diet, with the exception of liver. The chief substitutes for bread are bran-cake or biscuits, gluten bread, almond rusks and biscuits, or thin slices of bread toasted until they are almost black; eggs, butter, cheese, broths, good soups, and jellies are admissible; also vegetables not containing sugar or starch, such as cabbage, Brussels sprouts, broccoli, cauliflower, lettuce, cress, mustard, and celery.

The question of drink is also of much moment. Milk is theoretically contraindicated, because it contains much sugar, but it has been found in some instances that when given in moderate quantities it is not injurious, and may even prove beneficial. Therefore it is allowable to try the effects of a regulated amount in any individual case, and be guided accordingly. It may be mixed with lime water or soda water. Cream may be given in abundance if it agrees. Dr. Donkin has advocated the treatment of diabetes entirely by skimmed milk, in quantities of from 6 to 8 or even 12 pints daily, and continued for several weeks if necessary, no other food or medicine being allowed. My experience of this treatment is anything but favorable, but I have found benefit from giving a considerable quantity of skimmed milk daily, along with other food. The balance of evidence is decidedly against the use of alcoholic stimulants to any extent. A small quantity is frequently serviceable, those forms of stimulant being employed which are most free from sugar, viz., dry sherry, bitter ale, brandy or whisky, well-diluted claret, and Burgundy. Tea and coffee without sugar may be allowed, and also cocoa made from the nibs, provided it agrees. It is not desirable to restrict the quantity of liquid too much, but it must be moderated so far as the feelings of the patient will permit. Most injurious is it to knock off liquids suddenly, and I have known a rapidly fatal issue result from this cause. Thirst may be relieved by iced water; acid drinks, of which a solution of phosphoric acid has been much recommended; or solution of cream of tartar. Prout affirmed that tepid liquids give more relief than cold. The Bristol Hotwells, Carlsbad, and Vichy waters, are said to have an influence on diabetes, in addition to being serviceable as a drink.

It is highly important to attend to certain matters in regulating the diet. 1. The change should be brought about gradually and not suddenly. 2. Frequent variations in the food should be made amongst those articles which are permissible. 3. In many cases it is necessary to watch carefully that the regimen laid down is strictly attended to, especially at the early period of treatment, and among ignorant patients. 4. Every individual case must be studied for itself, and the advisability of persevering in the restricted diet or not judged by the results. In some instances, where there is much loathing of the food, a little bread is often of great benefit. Again, if a fair trial of the recognized diet seems to lead to no improvement, or if the general condition is getting

worse, as may happen especially when the disease is very advanced, it may be desirable to let the patient follow his own inclination, guided by intelligence; sometimes also patients cannot possibly take the prescribed food, and then a mixed diet must be permitted.

Allusion may be here made to the saccharine treatment of diabetes, in which sugar and honey are administered in considerable quantities, any diet being allowed. This has been proved to be decidedly injurious in the majority of cases.

2. General hygienic management is highly important. The patient should be completely clad in flannel, and have two or three warm baths every week. Change of air, especially to the seaside, with sea-bathing, is useful in some cases.

3. Numerous medicines have been brought forward, supposed to have a direct curative influence upon diabetes, especially in limiting the discharge of urine and sugar. The principal of these include opium, given in gradually increasing doses up to gr. vi—xx daily, which certainly seems to be useful in some cases; alkaline bicarbonates, pepsin, rennet, arsenic, iodine, bromide of potassium, and peroxide of hydrogen. The evidence in favor of the value of most of these is very slight.

4. Symptomatic treatment often calls for attention in diabetes, this being especially directed to the digestive organs; the general condition and state of the blood; nervous disturbance, in the way of sleeplessness and restlessness; and to the various complications. These must be managed on ordinary principles. Iron and tonics are often of much service. Codeia, in doses of gr. $\frac{1}{4}$ to gr. $\frac{1}{2}$ every night and morning, has been found useful as a sedative.

DIABETES INSIPIDUS.

This affection is characterized by great thirst, with an increased flow of urine, which is watery and of low specific gravity, but does not contain any sugar or other abnormal ingredient. The proportion of solids discharged in the twenty-four hours may be normal, excessive, or below par. Frequent micturition is often observed. Occasionally the patient enjoys excellent health, but more commonly there are more or less of the symptoms noticed in diabetes mellitus, especially a dry and harsh skin, loss of flesh and weakness, and dryness of the mouth. In most cases the appetite is not excessive, but sometimes it is voracious. As a rule the complaint is chronic in its onset and course; occasionally it sets in suddenly. Recovery is extremely exceptional, but death usually results from some organic complication.

The *etiology* of diabetes insipidus is very obscure. The probable immediate cause is dilatation of the renal vessels from paralysis of the muscular coat, resulting from deranged innervation. The condition

can be induced by irritating a certain spot in the floor of the fourth ventricle. It has also been attributed to injury of the nervous centres or sympathetic; organic diseases of the brain and cord; depressing emotions; hysteria, neuralgia, and other nervous disorders. Among other alleged causes are exposure to cold, drinking cold water when heated, violent effort, previous febrile and inflammatory attacks.

TREATMENT.—Opium, valerian, camphor, nitrate of potash, iron, and iodide of potassium, are the chief remedies recommended. Withdrawal of liquids has not been successful. The use of the constant galvanic current, applied over the hypochondrium, has been advocated.

II. LOCAL DISEASES.

IN treating of local diseases, it is proposed to indicate the general clinical characters which belong to each organ or system, and the methods to be employed in their investigation, before entering upon the consideration of the individual disorders to which they are liable. It may be stated once for all, however, that it is always of essential importance to study the constitutional condition of the patient, as this materially affects the diagnosis, prognosis, and treatment of local affections. Some of the more important symptoms will be discussed as fully as space will permit.

CHAPTER I.

DISEASES OF THE MOUTH, TONGUE, AND SALIVARY GLANDS.

CLINICAL CHARACTERS.—Important indications are often afforded by the mouth and tongue with regard to the state of the system generally, and of the alimentary canal, but these parts may also be the seat of local affections, to which attention will now be directed. Their presence may be revealed by some or all of the following symptoms and signs:

1. Altered sensations, such as pain, soreness, a feeling of heat or dryness, and various derangements of the sense of taste.
2. More or less interference with the actions carried on in the mouth, viz., mastication, sucking, the first stage of deglutition, and articulation. These acts are often also attended with pain.
3. Changes in the quantity or quality of the saliva; or the escape of unusual discharges, such

as pus, blood, etc. 4. A disagreeable odor of the breath, which may amount to extreme fetor. 5. Interference with the act of breathing occasionally, owing to mechanical obstruction to the passage of air. 6. A change in color, or the existence of any swelling, deposit, ulceration, or other morbid condition, as disclosed on a careful examination of the mouth, aided by a good light. At the same time the glands in the neighborhood should also be examined.

1. INFLAMMATION OF THE MOUTH—STOMATITIS.

Stomatitis is a very common affection, and occurs under several forms. Its varieties are: 1. Catarrhal. 2. Follicular. 3. Aphthous. 4. Ulcerative. 5. Parasitic. 6. Gangrenous. 7. Mercurial.

ETIOLOGY.—The chief *predisposing causes* of stomatitis are: 1. Age, the different forms being far most common in infants and young children. 2. Improper hygienic conditions, such as want of cleanliness, impure air, unhealthy residence. 3. Errors in diet or an insufficient supply of food. 4. Certain unhealthy conditions of the system, or the presence of certain diseases. The different forms of stomatitis are exceedingly rife among the children of the poor, especially those living in large towns. This applies particularly to the more severe varieties, the gangrenous form being rarely met with except among this class of patients. Infants are very commonly affected who are brought up by hand or fed on artificial food, or who have suckled too long, or been nursed by an unhealthy mother. Children who are debilitated from any cause, and those prematurely born, are also very prone to this class of diseases. They are common in congenital syphilis, and as complications or sequelæ of one of the exanthemata. Thrush is frequently associated with typhoid fever, or, in adults, with chronic wasting diseases, especially phthisis. Gangrenous stomatitis rarely occurs except after some acute illness, particularly severe measles.

Exciting Causes.—1. Local irritation is one of the most frequent causes of stomatitis. This includes neglect of cleansing the mouth, irritation of dentition, decayed teeth, suckling imperfectly-formed or inflamed nipples, or for too long a time; as well as all forms of mechanical or chemical irritation, heat and cold, excessive smoking, wounds, ulcers, and other irritating morbid conditions. 2. The milder varieties may be dependent upon disorder of the alimentary canal. Repeated follicular stomatitis in adults generally indicates some gastric derangement. 3. The presence of some poison in the blood frequently excites inflammation in the mouth. This partly explains its occurrence in the acute specific fevers. Metallic poisons, however, are those which ordinarily act in this way, especially mercury. 4. Catarrh of the mouth may be due to extension of inflammation from neighboring parts. Thus it may be associated with erysipelas of the face, or throat affections. 5. Contagion produces some forms of stomatitis. Thrush can be propagated by direct transplantation of the fungus, though it

does not usually spread in this way, but probably is due to the presence of the spores in the air, which in the mouth find favorable conditions for their development in the decomposing food and epithelium, aided by the parts being kept at rest, and by want of cleanliness. Some believe that ulcerative stomatitis is contagious.

SYMPTOMS.—Each variety of stomatitis will need a brief description.

1. **SIMPLE OR CATARRHAL.**—When acute, this form begins as small bright-red patches on the inside of the cheeks, or at the angles of the mouth. Ultimately, by extension and coalescence of the patches, the whole surface may be covered. There is more or less swelling of the affected parts. At first the surface is dry, but soon excessive secretion forms, containing many imperfect cells. Superficial erosions or ulcerations are often produced. The subjective sensations are pain or soreness, heat, a slimy sensation in the mouth, and impaired or unpleasant taste. The breath is often disagreeable. Generally the alimentary canal is out of order, as evidenced by a furred tongue, loss of appetite, and, in children, disturbed bowels and flatulence. Children are also irritable and sleepless. Catarrh of the mouth often occurs as a chronic affection.

2. **FOLLICULAR OR PAPILLARY.**—At first little red raised spots are seen, which feel hard; these are due to enlarged and obstructed mucous follicles. As a rule they soften and burst, discharging their contents, and leaving small, circular, well-defined ulcers, with some surrounding redness. A good deal of soreness is complained of.

3. **APHTHOUS OR CROUPOUS.**—Much confusion has existed with regard to what is meant by aphthæ, but it seems best to restrict the term to certain small ulcerations, which have a special mode of origin. They commence as small whitish or whitish-yellow spots on the lips, cheeks, palate, or tongue, which are often in considerable number, and may become confluent. More or less redness surrounds them. These are generally considered to be vesicular and to contain a fluid, which gradually becomes opaque, while the vesicles ultimately rupture. Some, however, regard them as solid exudations under the epithelium, of a croupous nature, which become detached from the circumference towards the centre, leaving superficial ulcerations. This form is usually attended with much pain, rendering sucking, mastication, deglutition, or speaking very difficult to perform. The buccal secretion is increased, and there may be much salivation. The breath has often a very disagreeable smell. Infants are usually feverish and restless, even for some days before the aphthæ appear. They refuse nourishment, but are thirsty. The tongue is furred, and diarrhœa or vomiting may be present.

4. **ULCERATIVE OR DIPHTHERITIC—GINGIVITIS ULCEROSA.**—This is a form of inflammation which usually ends in extensive and unhealthy ulceration, and it may occur as an epidemic. It is regarded by some

as of a diphtheritic nature. As a rule it begins on the margin of the lower gums in front, but may extend backwards, or to the lips, cheeks, or tongue. The gums appear much congested, swollen, and spongy; bleed very readily, and seem separated from the teeth. Soon a deposit is observed, in the form of membranous-looking patches, at first whitish, but speedily becoming gray, or even black. Tolerably firm and adherent at the outset, and leaving a bleeding surface when detached, the substance shortly becomes soft and pulpy. Some consider that the mucous membrane itself is involved, a diphtheritic slough being formed. The patches usually separate, leaving irregular ulcers, which may spread and run together, so as to give rise to an extensive ulcerated line or surface. The margins of the ulcers are raised, the membrane around being congested, swollen, and œdematous. They are usually not deep, and their surface is covered with a pulpy, yellowish substance. If properly treated, they generally heal quickly, but in some cases serious results follow, the teeth dropping out, and the jaws becoming carious or necrosed.

The subjective symptoms are generally severe. There is a great deal of pain, increased by any movement of the jaws or other local irritation; hence there is much difficulty in chewing or swallowing. The saliva is very abundant, and frequently mixed with blood and other matters. The breath is very fetid. Often the glands in the neighborhood are enlarged and tender. In most cases the constitutional symptoms are but slight.

5. PARASITIC OR FUNGUS—THRUSH—WHITE MOUTH.—By these and other names a variety of stomatitis is described, which depends upon the presence of a parasitic fungus, the *oidium albicans*. At first red patches form, on which whitish points appear, which may extend and coalesce into considerable patches of variable thickness. They look like curdled milk, being of a soft consistence and soon easily detached. They consist of epithelium and fat, in which are imbedded the sporules and filaments of the fungus. The deposit first appears generally about the angles of the mouth, but may be noticed on any part of this cavity, and even extends occasionally to the pharynx, larynx, œsophagus, or, very rarely, to the stomach. There is necessarily a good deal of pain and soreness about the mouth, which is hot and dry, the saliva being diminished in quantity at first.

Very young infants are subject to thrush as a distinct affection, being preceded by some slight fever, and attended with digestive disorders, evidenced by vomiting, diarrhœa, pain, tenderness, and swelling of the abdomen, and irritation about the anus. In most cases, however, it is associated with some pre-existing disease, especially certain acute specific fevers and chronic exhausting diseases, such as phthisis. Under these circumstances there may be no symptoms. In connection with

the acute specifics it does not add to the danger; but in the chronic affections it is commonly a sign of approaching death.

6. GANGRENOUS—CANCERUM ORIS—NOMA—WATER CANKER.—This is a very rare, but exceedingly dangerous form of stomatitis. It begins insidiously, and almost invariably first affects one of the cheeks, attacking its inner surface. When the patient comes under observation, there is usually a circumscribed hard swelling in the cheek, with surrounding œdema. The skin covering it is tense, shining, and hot, generally red, the color shading off from the centre, which is bright; sometimes the surface is pale or mottled. The mucous membrane is merely reddened at the outset, but soon becomes discolored and gangrenous, and a vesicle often rises upon it. Then a small irregular ulcer forms, with jagged, red or livid edges, and a sloughy surface. After a time the central spot of bright redness becomes livid and finally black, being converted into a dry slough, which extends rapidly. At the same time the gangrene is spreading internally, so that finally the entire cheek may be affected, or even one-half of the face or more, while the gums, lips, and tongue are also frequently involved to a variable extent. When the sloughs separate, the mouth is opened up, the teeth often drop out, and the bones may be exposed and necrosed. A hideous excavation with ragged gangrenous edges is left, which may still go on spreading. If the destructive process is checked, the surface may clean, granulate, and cicatrize, but great deformity often results, with adhesion of various structures.

The gangrene does not necessarily spread to the extent just described. It may only cause a hole in the cheek, which ultimately closes up or remains as a fistulous opening. The glands and tissues around are always infiltrated, swollen, and hard.

One of the most striking features of this disease is that pain and tenderness may be either very slight or altogether absent. A large quantity of saliva flows from the mouth, extremely fetid, and mixed with blood and gangrenous discharges. Serious hæmorrhage does not occur, because the vessels are blocked up by coagula. The breath has an excessively foul, gangrenous odor.

The general symptoms vary considerably, but it is often observed that even when the disease is extensive they are by no means severe. Much will depend upon the previous condition of the patient. There is not much fever as a rule, the skin being cool; and the strength may be fairly maintained for awhile, at the same time food being taken eagerly. The pulse at first is rather frequent. As the disease progresses there is a tendency to prostration, the patient ultimately becoming extremely low and asthenic, with a very feeble and small pulse. Food may be taken to the last, and there is much thirst. Diarrhœa often sets in. The patient frequently becomes delirious or drowsy in fatal cases. Death may result from septicæmia or asthenia.

7. MERCURIAL.—The first effect of mercury is to cause redness and tumefaction of the gums, which feel tender and bleed readily, while the patient experiences a peculiar metallic taste, the saliva is increased, and the breath has a characteristic unpleasant odor. Afterwards superficial grayish sloughs and ulcerations form along the margins of the teeth, and the gums become detached, the teeth loosening or even falling out. There may be extensive inflammation of the mouth and tongue, ending in ulceration, suppuration, or actual gangrene. Salivation becomes very profuse, various discharges being mixed with the saliva. The salivary and lymphatic glands and other structures are swollen and painful, while there is much pain in the mouth and face, with difficulty in moving the jaws and in swallowing or speaking. Only slight constitutional symptoms are usually observed.

DIAGNOSIS.—The different forms of stomatitis are readily recognized when the mouth is properly examined. In infants it is important to bear these complaints in mind, and to look to the mouth should they appear to be ailing. It must also be mentioned that the ulcerative and gangrenous varieties sometimes set in and extend very insidiously, giving rise to little or no disturbance. Fetor of the breath may lead to their discovery.

PROGNOSIS.—The ulcerative and gangrenous forms of stomatitis may prove serious. In chronic wasting diseases, especially phthisis, the occurrence of thrush may indicate a speedily fatal termination.

TREATMENT.—The indications for the treatment of the various forms of stomatitis may be summed up as follows :

1. Hygienic conditions must be properly observed and regulated in every respect.
2. Particular attention is required with regard to diet, especially in the case of infants. If they are suckling, care must be taken that they are not fed too frequently or excessively, and that the nipple is properly cleansed, and in other respects satisfactory. At the same time the mother's health must be looked to, and she must be prevented from using irritating articles of food. If brought up by hand good milk should be given, and the bottle must be kept scrupulously clean and used only at regular intervals. Inquiry should also be made as to artificial diet employed, as this is often of a very irritating nature.
3. The state of the alimentary canal frequently needs correction. Aperients are called for in many cases, such as castor oil, a dose of jalap with calomel, or rhubarb with magnesia. Antacids are also valuable, especially lime water with milk, carbonate of soda, magnesia, or chalk.
4. A most important indication is to remove or avoid all sources of local irritation, such as dentition, bad teeth, and excessive smoking. In the case of infants the mouth must be properly cleansed. In mercurial stomatitis of course the withdrawal of the poison is essential.
5. Local applications. In simple stomatitis nothing is required, unless there is much mucus on the surface, when it is desirable to wash the mouth out

with a weak solution of carbonate of soda or chlorate of potash. In the aphthous, follicular, and ulcerative forms, a solution of chlorate of potash is very valuable, either employed as a mouth-wash or directly applied with a camel's-hair brush. If there is much irritation, demulcent washes afford relief, such as thin mucilage. A weak solution of Condyl's fluid is serviceable for the purpose of checking fetor. Subsequently astringent applications are often called for, especially alum in the form of solution or powder. The direct application of nitrate of silver to ulcers may be requisite, either in the solid form or as a solution. In thrush various local remedies are useful, viz., a solution of sulphite of soda (3i ad 3i); borax and honey; vinegar and water; creasote; bromide of sodium with glycerin and water; or solution of chlorate of potash. Cancrum oris calls for energetic local treatment. The gangrenous surface must be at once freely and effectually destroyed by strong nitric or hydrochloric acid, the former being preferable, and it may be necessary to repeat the application. Antiseptic mouth-washes should be freely used, such as one containing Condyl's fluid, chlorine, or carbolic acid, which may also be employed as dressings. Chlorate of potash solution is very valuable in these cases. Poultices externally are also required, these being changed frequently, and covered with some antiseptic. 6. General treatment. In the majority of cases of stomatitis no general treatment is required, but, if the health is lowered from any cause, it is important to use means for its improvement. When there is extensive ulceration, tonics, tincture of steel, and nutritious diet, are often of essential service, and the internal administration of chlorate of potash leads to most satisfactory results. In gangrenous stomatitis one of the most necessary parts of the treatment is to keep up the patient's strength in every possible way, by means of nourishing soups, wine or brandy, ammonia and decoction of bark, mineral acids, or quinine with iron. Chlorate of potash solution should also be employed as a drink.

II. GLOSSITIS—PARENCHYMATOUS INFLAMMATION OF THE TONGUE.

This is an inflammation of the actual substance of the tongue, leading to an exudation among its muscular fibres, and exceptionally involving the latter also. It is a rare but very acute and dangerous affection.

ETIOLOGY.—1. Some direct irritation is almost always the cause of glossitis, which may result from mechanical injury; swallowing boiling liquids; acrid or corrosive substances; or the stings of insects, especially the bee and wasp. 2. It is very rarely due to some poison in the blood, either mineral (mercury), animal, or vegetable. 3. Occasionally glossitis occurs as a complication or sequela of one of the exanthemata.

4. Very rarely it originates from extension of inflammation from neighboring parts, such as the tonsil.

SYMPTOMS.—The entire tongue is usually implicated, and presents the following characters. It is enlarged, so that the mouth cannot contain it, and may project some distance beyond the teeth, being marked by them at the sides, and the pressure may lead to ulceration. The surface is dark red, generally smooth, shining, and tense, but it may be fissured. The dorsum is covered with fur, which tends to be brownish. Owing to its protrusion and exposure, the tongue soon becomes dry. If resolution does not rapidly take place, small abscesses may form, which coalesce and then burst or are opened. Rarely gangrene occurs. The tongue may remain large for a long time. This condition is attended with considerable pain and tenderness, and a feeling of heat, as well as other uncomfortable sensations. All the functions of the tongue are necessarily greatly interfered with. Occasionally by its mechanical obstruction, or by pressing upon or causing œdema of the larynx, the enlarged organ seriously impedes respiration, and may even threaten asphyxia. There is much salivation, and the breath is very disagreeable. The glands and tissues around are usually inflamed, and the face may appear tumid and congested, from pressure on the jugular veins.

The general symptoms are usually severe, there being much inflammatory fever, with marked restlessness. Nutrition becomes greatly impaired, and there may be signs of imperfect aeration of blood.

DIAGNOSIS.—The appearances presented by the tongue, and the accompanying symptoms, are sufficiently characteristic of glossitis.

PROGNOSIS.—Glossitis is at all times a serious affection, but especially when it results from severe local irritation. It may lead to speedy suffocation. The existence of abscesses makes the prognosis worse.

TREATMENT.—The first thing to be done is to neutralize any irritating cause, if possible, as for instance the sting of a wasp, which should be immediately touched with solution of ammonia. For severe glossitis, the best treatment seems to be to make free and deep incisions along its upper surface. In milder cases leeches about the angle of the jaw are recommended. Ice should be constantly given to suck, and the parts kept moist. Saline aperients may be administered, if required. Ammonia and stimulants are often of great service. As food cannot be taken in many cases, it may be necessary to administer nutrient enemata regularly. If asphyxia is threatened, it is sometimes requisite to perform laryngotomy or tracheotomy. Incisions must be made when there are signs of abscesses having formed.

CHRONIC GLOSSITIS is occasionally met with, either as a sequel of the acute form, or as the result of some chronic irritation. It may affect the entire tongue, but is usually partial, the organ presenting indurated fibrous patches, especially on its margins. A peculiar form is described

under the term *glossitis dissecans*, in which the tongue presents deep furrows upon its surface, which tend to ulcerate.

As regards treatment, pressure, ligature of the lingual arteries, or excision, may be necessary.

III. ULCERS OF THE MOUTH AND TONGUE.

In addition to the forms of ulceration already considered, the following may occur: 1. Herpetic ulcers, due to an eruption of herpes in the mouth. 2. Variolous ulcers, resulting from small-pox pustules. 3. Syphilitic ulcerations. These are very frequent on the tongue. 4. Scorbutic, chiefly seen about the gums. 5. Cancerous. 6. Ulcers due to local irritation. These are also common on the tongue, beginning often as small vesicles about the tip and sides. They are generally due to irritation by the teeth, and may become very hard, so as to simulate syphilitic ulcers.

TREATMENT.—This consists: 1. In the removal of all sources of local irritation. 2. In attending to the constitutional condition. 3. In the use of local washes and direct applications, disinfectant, astringent, or demulcent, according to circumstances. The application of nitrate of silver is often most useful. Chlorate of potash is also very valuable.

IV. SYMPTOMATIC PAROTITIS—PAROTID BUBO.

ETIOLOGY.—The form of parotitis characteristic of mumps has already been described, but a brief account is required of a variety which is liable to attend certain acute diseases as a complication or sequela. It is frequent during severe epidemics of typhus fever, but may be met with also in connection with small-pox, measles, scarlatina, cholera, pneumonia, and other complaints. Sometimes it arises by direct extension, as when it follows erysipelas of the face.

ANATOMICAL CHARACTERS.—Symptomatic parotitis differs from the idiopathic form in its great tendency to end in suppuration, though this is not invariable, for resolution may take place. After a period of congestion and tumefaction a substance collects in the ducts, which soon changes into pus. The lobules break down in the centre, and either form a number of distinct abscesses, or run into one large accumulation of matter, the cellular tissue which separates them being destroyed. The parts around may be extensively involved, cellular tissue, muscles, periosteum, and bones, and the inflammation may even extend to the cerebral meninges or the brain itself, as well as to the ear. Thrombi may form in neighboring veins, leading to embolism and septicæmia. Gangrene sometimes occurs.

SYMPTOMS.—These are usually by no means marked at the commencement, and the inflammation often advances very insidiously. When it

ends in suppuration the skin becomes red, and prominent fluctuating points appear. If the pus is not evacuated externally, it may be discharged into the external meatus, pharynx, or mouth, or may find its way to the lower part of the neck or even into the thorax. The general symptoms are usually of a low adynamic type.

TREATMENT.—The local treatment should consist of frequent poulticing and the use of fomentations; as soon as signs of suppuration appear proper incisions should be at once made. Internally stimulants and tonics are generally required.

V. CHRONIC ENLARGEMENT OF THE PAROTID.

Occasionally the parotid is chronically enlarged, as the result of previous inflammation, or from the growth of cancerous or other forms of tumor. This may give rise to marked pressure-symptoms. It usually needs surgical interference.

VI. SALIVATION OR PTYALISM.

Increased flow of saliva is a frequent and troublesome symptom, brought on by a variety of causes. In some cases it is not actually formed in excess, but is allowed to flow from the mouth instead of being swallowed, so that it appears to be abnormal in quantity. The amount discharged varies greatly, but it may be exceedingly large, either continually running from the mouth, or causing a person to be perpetually spitting or swallowing, or to saturate several handkerchiefs daily. The fluid is not quite identical with healthy saliva, and may be mixed with various morbid materials. It contains some mucus, with numerous epithelium-cells. Its reaction is alkaline, and it yields a good proportion of fat, but little or no ptyalin or sulphocyanide of potassium after a time. Albumen is sometimes present. Digestion is generally impaired, and considerable emaciation may be produced. Sometimes the fluid is ejected from the stomach in considerable quantity.

ETIOLOGY.—1. More or less salivation accompanies the various sources of irritation about the mouth already considered, such as stomatitis or ulcers; and is also produced by irritating substances taken into the mouth. These act by causing reflex excitation. 2. Reflex irritation through other nerves often causes ptyalism. Thus it may be associated with throat inflammations, many diseases of the stomach and pancreas, or worms in the intestines; in pregnancy it is a very common symptom. 3. In certain nervous diseases salivation is not uncommon, as in various forms of insanity, hydrophobia, hysteria, paralysis, and neuralgia of the face. In some of these affections it is produced in a reflex manner; in others by some direct influence from the brain. 4. Certain metallic and vegetable substances, when taken for some time, induce

ptyalism, by causing local irritation, and also directly influencing secretion. Of these the most important is mercury, but iodine and other substances sometimes act in this way. 5. Critical salivation attends some cases of fever, but is not always associated with a crisis. 6. Infants and old people are liable to an excessive flow of saliva. In the former it is often associated with dentition. In both there is frequently no excess formed, but it is allowed to escape from the mouth instead of being swallowed. 7. Idiopathic salivation is that form which occurs without any obvious cause.

TREATMENT.—1. The cause must be sought out, and if possible removed. In many cases this is all that is required. 2. Local astringent mouth washes are useful, such as solution of alum, tannic acid, oak bark, or weak mineral acids; or alum may be sucked. 3. Opium is recommended as a valuable internal remedy in obstinate cases.

CHAPTER II.

DISEASES OF THE THROAT.

CLINICAL CHARACTERS.—Throat complaints are of very common occurrence, and may be indicated by the following clinical phenomena :

1. The presence of soreness, pain, or other abnormal sensations. These vary greatly, both in degree and kind; but among the most common are a sense of dryness, burning, tightness, or as if a foreign body were present, which induces a constant desire to hawk or swallow. There may also be external tenderness.
2. Disorders of deglutition. This act may be painful or difficult, or even quite impossible, and sometimes substances tend to pass in wrong directions, such as into the larynx or posterior nares. The physical conditions of the materials which are being swallowed—such as whether solid or liquid, hot or cold—often influence the degree of dysphagia.
3. Alteration of the voice, which is either somewhat hoarse or husky, or even completely altered in its quality, becoming thick and nasal. The act of speaking may cause pain.
4. Cough. This is a very common and troublesome symptom attending throat affections, especially those of a chronic nature. Even in pulmonary affections, especially phthisis, the state of the throat often increases this symptom considerably, and the same is true of the so-called "stomach-cough" accompanying dyspepsia. Frequently it is attended with the discharge of much mucus.
5. Disturbance of breathing. There is not as a rule any difficulty of breathing in mere throat affections, but in certain cases considerable dyspnoea may be felt, especially on lying down, and patients often breathe with the mouth wide open and snore loudly.
6. Foulness of the breath.
7. Deafness occasionally, due to obstruction about the opening of the Eustachian tube.
8. A careful examination of the whole of the fauces is requisite, whenever symptoms point to this part as being the seat of mischief. A good light is needed, and it is sometimes useful to employ artificial light by means of the reflector of the laryngoscope. The tongue must be kept down by a depressor or by the finger. In some cases it is also desirable to use the finger for the purpose of feeling. By this examination a knowledge is gained : *a*, of the appearance of the general surface as regards color, degree of moisture, etc.; *b*, of the presence of any deposit or accu-

mulation of secretion; *c*, of the general form and dimensions of the pharynx and its openings, as well as of the size, shape, and other characters of the soft palate and its arches, the uvula, and tonsils; *d*, of the existence of any enlarged follicles, abscesses, ulcers, vesicular or other eruptions, gangrene, old cicatrizations, polypi, cancerous or other tumors. At the same time the external structures of the neck should be examined, particularly those about the angles of the jaw. It will be well also to notice the state of the mouth and lips.

I. ACUTE INFLAMMATORY AFFECTIONS OF THE THROAT.

The throat is the seat of acute inflammation of a special character in diphtheria and scarlatina; thrush may also extend from the mouth to this part; or it may be inflamed in connection with eruptions on the mucous surface, especially herpetic and variolous; or from the extension of erysipelas from the face. At present, however, attention will be confined to local inflammatory affections, which are of considerable importance.

ETIOLOGY.—*Predisposing Causes.*—Throat inflammations may occur at any age, but are most common on the whole in adults, probably because they are more exposed to the exciting causes. Tonsillitis is chiefly met with among young persons. Former attacks seem to increase the liability to throat inflammations, many individuals suffering constantly, or being liable to periodic attacks. Anything that lowers the health is stated to be a predisposing cause of sore throat, and certainly this is true with regard to living in a hospital for some time. Persons who are constitutionally weak appear to suffer with unusual frequency, and syphilitic individuals are decidedly more liable than others. Intemperance is said to predispose. Tonsillitis appears sometimes to run in families. Most cases occur during spring and autumn.

Exciting Causes.—1. Inflammatory throat affections are generally the result of "taking cold" in some way or other, especially from exposure to cold and wet, to sudden changes of temperature, or to damp, cold winds. In many cases the complaint seems to be but a part of a general catarrh from this cause. 2. Occasionally the milder forms of sore throat appear to be due to some derangement of the alimentary canal; follicular pharyngitis is often associated with stomach disorders. 3. Local irritants excite more or less inflammation, which may then be very serious, as from swallowing hot water or chemical irritants. 4. Certain forms of throat inflammation may perhaps be due to some poison in the atmosphere acting on the system. Some cases of hospital sore throat seem to arise in this way. 5. Pharyngeal catarrh often accompanies the exanthemata. 6. Excessive use of the voice is liable to cause sore throat, especially the follicular variety, which is a part of "clergyman's sore throat."

SYMPTOMS.—Cases of acute inflammation affecting the different structures of the throat may be conveniently arranged under the following groups:

1. ACUTE PHARYNGEAL CATARRH—CATARRHAL PHARYNGITIS—RELAXED SORE THROAT—CYNANCHE PHARYNGEA—ANGINA SIMPLEX.—A large proportion of sore throats may be included in this general group, which are due to catarrhal inflammation of the fauces and pharynx, differing much in its extent and severity in different cases. Occasionally the inflammation is of a severe character and extends more or less deeply. Uneasiness, soreness, or pain is experienced in the throat, according to the degree of inflammation, often accompanied with a sense of heat and dryness. Swallowing is always attended with discomfort, and is often painful, though the patient may be constantly inclined to perform the act, owing to a feeling as if there were something in the throat, especially if the uvula is involved. There is also a frequent tendency to cough and hawk, in order to remove the secretion formed. The voice is often thick or husky, and the act of speaking may cause pain, but there is no dyspnoea. The symptoms are generally worse during the night and after sleep. Occasionally deafness is complained of, the Eustachian tube being blocked up.

Examination reveals more or less general redness, which is usually bright, but may tend to lividity. The surface appears dry and glistening. Considerable submucous œdema may be observed where the tissue is loose, giving rise to swelling and a watery translucent appearance, particularly in connection with the uvula. A deposit of secretion often forms in patches and points over the back of the fauces and on the tonsils; these sometimes look remarkably like diphtheritic patches, but they are easily detached without causing bleeding or excoriation. Not uncommonly superficial erosion is produced, and the more intense degrees of inflammation are liable to terminate in ulceration or more or less deep suppuration; the latter may constitute a pharyngeal abscess.

In slight cases there are no general symptoms. The more severe forms may be ushered in with chilliness, headache, and pains in the limbs, and attended with pyrexia. The pulse may rise to 100 or 120, and the temperature to 102° or even higher. A bright blush occasionally suffuses the face and upper part of the body, where there is no reason to suspect scarlatina. In two cases I have met with albuminuria, which entirely disappeared after a time.

Sore throat may come on very rapidly and attain considerable severity in a few hours, particularly a form of hospital sore throat, which appears to be of an erysipelatous nature. This generally sets in during the night, and by the morning the symptoms are very prominent. There is much œdema and swelling, but no particular redness, deglutition being very uncomfortable and difficult.

2. ACUTE FOLLICULAR PHARYNGITIS.—This variety is characterized by the follicles of the throat being chiefly attacked, which become enlarged, hard, and red. It is attended with a good deal of soreness or pain, and abundant secretion forms, causing continuous hawking. Sometimes the follicles suppurate and ulcerate.

3. ACUTE TONSILLITIS—AMYGDALITIS—CYNANCHE TONSILLARIS—QUINSY.—This affection consists in a parenchymatous inflammation of one or both tonsils. Usually there is some general febrile disturbance before throat symptoms arise. These are soon manifested, however, and they may appear simultaneously with the fever. At first uneasiness is felt over one or both tonsils, which soon increases to considerable pain of a dull, aching character, with much tenderness. The throat feels dry, and there is a most uncomfortable sensation as if a foreign body were present. External tenderness is experienced behind the angles of the jaw, which may be considerable. Deglutition is difficult and causes much distress, the pain during the act often shooting towards the ear, while in severe cases fluids may return through the nose. After a time a quantity of sticky mucus forms, entailing frequent efforts to swallow or hawk. The voice is characteristically altered, having a thick, muffled, guttural, or nasal character, which cannot be mistaken when once heard; occasionally it is altogether lost. Breathing is not interfered with as a rule, but if both tonsils are greatly enlarged dyspnoea may be felt, especially on lying down. The patient snores loudly during sleep, and on waking the symptoms are always worse. The breath is very unpleasant. Salivation may be present. Deafness and noises in the ears are often complained of.

Examination of the throat is not always easy in tonsillitis, but if it can be effected the appearances observed are—general redness of the fauces, but more particularly of one or both tonsils; enlargement of these, sometimes so great as to cause them to meet in the middle line and almost completely to block up the passage, while they look like balls of flesh, and may actually ulcerate from mutual pressure; white or yellowish opaque spots or patches on the surface, being the products of secretion from the follicles. The palate and uvula are also swollen and œdematous, the latter being almost always observed to adhere to one of the tonsils. When the parts cannot be inspected, the finger must be made use of in order to feel the tonsils, and this is especially required in children, or in the later stages of the complaint to ascertain whether suppuration is taking place. Very often the salivary glands are swollen, and also the structures about the neck, especially the lymphatic glands, which are hard and tender, a good deal of stiffness and uneasiness being likewise experienced.

Tonsillitis is usually attended with considerable fever, and the patient feels decidedly ill, being often much prostrated. The temperature frequently rises to 102° or more, and may reach 104°; the pulse ranging from 100 to 120. There is often severe headache with much restlessness, and occasionally slight delirium at night. The tongue is covered with a thick creamy fur; appetite is lost, but there is much thirst; and the bowels are constipated. A red rash on the skin is now and then observed. The urine is markedly febrile, while chlorides are deficient or sometimes almost entirely absent.

Cases of tonsillitis vary greatly in their severity. Frequently only one tonsil is involved, but in many cases both are attacked, generally in succession, but occasionally simultaneously. The inflammation usually attains its height in five or six days, and the entire duration of most cases of tonsillitis is under ten days. Pathologically the disease may terminate in: *a.* Resolution, the symptoms gradually subsiding. *b.* Suppuration. This is very common, being indicated by the pain becoming more pulsating or throbbing, and shooting towards the ear; rigors; and the tonsil feeling soft and fluctuating, or the color of the pus may actually be evident through the redness. The abscess often bursts suddenly, either spontaneously or from some mechanical irritation, or it is opened, and this is followed by rapid improvement. Only one tonsil suppurates as a rule. *c.* Gangrene, of very rare occurrence, and only met with in those who are low and debilitated. *d.* Chronic enlargement, with a granular or irregular appearance, especially after repeated attacks ending in suppuration, and in weak individuals. Clinically cases of tonsillitis almost invariably terminate in recovery. Death is an exceedingly rare event, but may result from hæmorrhage or extension of inflammation to the larynx.

DIAGNOSIS.—The fact of the existence of an acute inflammation of the throat is usually readily recognized, and a proper examination will generally reveal its nature. A difficulty may, however, be experienced in determining whether the complaint is local, or merely a part of some general disease, especially diphtheria or scarlatina. A careful inquiry with regard to the etiology of the case; its mode of invasion; the other symptoms present; with the degree of pyrexia, ought generally to clear up any doubt. Sometimes it is requisite to wait for a short time before giving a definite opinion; and it must be remembered that sore throat may be almost the only symptom of scarlatina.

From laryngeal inflammations, those involving the throat are distinguished by the absence or slight degree of dyspnœa as a rule, or its different character when present; by deglutition being more interfered with; by the voice being less altered or affected in a different way; by cough being a much less marked symptom and not having laryngeal characters; and, above all, by the results of examination. It must be remembered that the inflammation may spread to the larynx; or the parts may be involved together, each then giving rise to its own special symptoms.

PROGNOSIS.—Local throat inflammations are rarely dangerous, but they may become so by leading to much œdema of the tissues, or by spreading to the larynx, being thus liable to cause suffocation. Death from hæmorrhage has in rare instances occurred in connection with suppuration in the tonsil. It is often difficult to get rid of the liability to attacks of sore throat.

TREATMENT.—In slight cases of sore throat the application of a wet

rag round the throat at night, covered with a piece of flannel, is all that is necessary. Even when the affection threatens to be severe, it may probably be checked not unfrequently by the assiduous application of cold water outside the throat, and the frequent sucking of ice.

In many cases, however, of acute inflammation about the throat, more definite treatment is required, and there are certain general rules which should always be carried out. The patient should be kept quiet, in a comfortably warm room, and not allowed to talk. A saline aperient may be given at the outset, and the bowels should be kept well opened. If there is pyrexia, and the patient is not very weak, it is useful to administer saline medicines for two or three days. It is not desirable to keep the patient low, therefore a good quantity of beef tea, milk, and other liquid nutritious food should be ordered, in moderate quantities, at frequent and regular intervals. Mucilaginous drinks afford relief, and the frequent sucking of ice is very grateful as well as beneficial. Stimulants are often indicated, good port wine being the best, this being particularly useful during convalescence, and in cases of tonsillitis; in the latter complaint from four to eight ounces may be given during the twenty-four hours.

It is affirmed that by the employment of certain drugs acute inflammatory affections of the throat can be very readily subdued, and their progress stopped. Dr. Ringer and others advocate the use of tincture of aconite in small doses frequently repeated. Guaiacum has also been supposed to exert a specific influence upon tonsillitis; and an emetic of ipecacuanha with tartar emetic at the outset has been considered efficacious in checking its course, but this is more than doubtful.

The remedies which I have found of most service are quinine (gr. i-ij); tincture of iron (℞ xv-xxx); or dilute nitric acid with decoction of bark. Either of these may be given at intervals of every three or four hours, or three times a day, according to the severity of the case, and they are often beneficial from the very commencement. Quinine and iron may in many cases be combined with advantage. A mixture containing dilute hydrochloric acid and chlorate of potash has been much commended in acute catarrh of the throat. It is often desirable to order some saline drink along with the tonics, such as a solution of citrate of potash, so as to maintain a free action on the part of the skin and kidneys. In cases of tonsillitis it is not unfrequently requisite to administer some narcotic at night, such as Dover's powder or hydrate of chloral, but sleep should not be too prolonged. The patient should rest with the head high.

Local treatment is always most important. In the various forms of pharyngeal catarrh steam inhalations, tepid milk and water gargles, with poultices and fomentations over the front of the neck, give most relief at first. Afterwards astringent gargles are useful, such as one containing alum, tannin, dilute mineral acids, or port wine. It may be

desirable to apply nitrate of silver or its solution, especially in the follicular variety. If there is dangerous œdema, it is necessary to scarify the surface; and should suppuration occur, the pus must be let out by incision.

For hospital sore throat the treatment which I have found always rapidly effective is to persevere in steam inhalation, in frequent gargling, and in the external application of heat and moisture; and to take large quantities of beef tea, a glass of port wine every three or four hours, and quinine in two or three grain doses every four hours.

In acute tonsillitis the best local treatment consists in the continuous application of heat and moisture to the throat, by means of steam-inhalations, and gargles of lukewarm water, or milk and water, to which a little Condyl's fluid may often be added with advantage, in order to diminish the unpleasant taste and odor of the breath. At the same time very hot and well-made linseed-meal poultices should be applied round the front of the neck, and changed at frequent intervals; or spongiopiline wrung out of hot water answers very well. When these are removed the part should be well fomented. These measures tend to subdue the inflammation if resolution is going to happen; or they will hasten the process of suppuration. When indications appear that pus has formed, it is desirable to let it out, and thus give immediate relief; or it may be requisite to puncture the tonsils, even though there is no distinct evidence of the presence of pus, should breathing be greatly impeded. Some advocate the use of irritating applications to the neck externally, such as sinapisms, liniments, and blisters, but to me these appear decidedly objectionable. Possibly, if there are very severe local symptoms, attended with great swelling, it might be advisable to apply two or three leeches behind the angle of the jaw.

During convalescence after tonsillitis tonics are needed for some time, with good nourishing food and wine. A change of air often does much good. Locally astringent gargles or other applications are necessary, the most serviceable being glycerin of tannin, tincture of steel with glycerin, or nitrate of silver solution. Should the tonsils remain permanently very large, it may be requisite to excise them.

As prophylactic measures in those who are subject to sore throat or quinsy, frequent cold douching of the throat externally, and the daily use of cold water or mild astringent gargles should be recommended. The general health must be attended to, and all injurious habits checked. A change of air and a course of tonic medicines frequently lead to good results.

II. ULCERATIONS OF THE THROAT.

Ulcers are very common in connection with the various structures of the throat, being either acute or chronic. They may be enumerated as:

1. Catarrhal, which are slight and superficial, being very frequently observed, especially at the back of the pharynx, and often associated with chronic catarrh. 2. Follicular. These are generally small, circular, or oval, corresponding to the follicles, but may by their union become irregular and of some size. 3. Syphilitic, either secondary or tertiary. 4. Scarlatinal. 5. Diphtheritic. 6. Ulcers following eruptions, such as herpes. 7. Gangrenous ulceration, or sloughing sore throat—*Cynanche*, or *angina maligna*. This form of ulceration is generally associated with syphilis or scarlatina, but may be independent of these affections. Thus it may follow severe catarrhal inflammation, if the patient is in a very low state of health from any cause; and occasionally it occurs as a complication of typhus, enteric fever, or other exanthemata. It spreads more or less extensively, but not as a rule deeply, and the mucous membrane is dusky, while there is much œdema around. 8. Ulcers on the tonsils, simulating syphilitic ulcers, but probably originating in blocking up and inflammation of their follicles. 9. Cancerous ulceration, which is extremely rare.

SYMPTOMS.—Ulceration of the throat may be unattended with any symptoms, even when of considerable extent. Usually, however, local symptoms are present to a greater or less degree. There may be merely uneasiness, or pain and difficulty in swallowing, but when certain parts are destroyed most unpleasant and dangerous symptoms are liable to arise. Food, especially of a liquid kind, may tend to pass into the posterior nares or down the larynx, instead of into the œsophagus. The voice is often completely altered, being thick, guttural, and indistinct, or the patient may scarcely be able to articulate at all. Offensive matters are hawked or coughed up, and the breath is in many cases very foul. It is important to notice that dyspnoea is not uncommonly present, with very noisy breathing, and that there may be a liability to sudden death from suffocation, in consequence of the ulceration involving the upper opening of the larynx.

Ulceration of the throat is often attended with a low condition of health, and there may be much emaciation and debility, owing to inability to swallow food. In gangrenous ulceration there is a danger of septicæmic symptoms setting in.

The consequences of ulceration are also frequently very unpleasant, in the way of permanent destruction of tissues, adhesions, contractions, etc. I have seen a case in which the throat was one large chasm, with thickened bands extending along its walls, every trace of its various parts having been removed. Of course, under these circumstances, swallowing is very difficult, and the voice is permanently altered.

DIAGNOSIS.—The fact that the throat may be ulcerated without any complaint of local symptoms being made by the patient should be borne in mind. The smell of the breath has in not a few instances led me to the discovery of unsuspected ulceration, and when this is fetid,

the throat should always be carefully examined. In conducting the examination, it is necessary to raise the uvula in order to see the upper part of the back of the pharynx, as ulcers are not uncommon here, and may otherwise be overlooked. It is important to determine the nature of any ulceration of the throat, especially if it should be of syphilitic character.

PROGNOSIS.—Ulceration of the throat may prove immediately dangerous, in consequence of spreading to the larynx, giving rise to hæmorrhage, or inducing septicæmia. Some forms are difficult to cure. The destructive effects of ulceration may lead to serious permanent mischief.

TREATMENT.—*Local.* For most ulcerations of the throat nothing answers better than the frequent use of chlorate of potash as a gargle (3ij—ijj to Oj); or in the form of lozenges or spray. Follicular ulcers and others of a chronic nature often require to be freely touched with nitrate of silver or its solution. When the surface is sloughy, antiseptic gargles must be abundantly employed, such as one containing Condyl's fluid, carbolic acid, creasote, or chlorine, and they may be used alternately with the chlorate of potash gargle. In gangrenous forms of ulceration, showing a tendency to spread, it is advisable to start by brushing the surface over carefully with strong nitric or hydrochloric acid, then proceeding with the other applications. Inhalations containing carbolic acid, creasote, or other antiseptics, are also very valuable.

General.—It is very important at the outset to determine the cause of any throat ulceration, and especially whether it is due to syphilis. If such is the case, iodide of potassium with decoction of cinchona bark or quinine generally produces the best results. Sometimes a mercurial course is required, but it must be conducted with care. It will often be found, even in syphilitic cases where there is much sloughing, that dilute nitric acid with decoction of bark brings about rapid improvement, and this mixture is very useful in other forms of gangrenous ulceration. Tincture of steel in 30 to 40 minim doses every four or six hours is also exceedingly valuable, especially if there is much debility, and it may be combined with quinine. The internal administration of chlorate of potash is recommended as a specific remedy in throat ulcerations. It has appeared to me to answer just as well if freely employed locally, but it may be given as a drink. Dr. Sansom advocates the use of the sulpho-carbolates. Not uncommonly one of the most important matters to attend to is the feeding of the patient. In many cases, owing to difficulty or pain in swallowing, very little or no nourishment is taken, and hence the system becomes greatly lowered, and healthy action cannot take place. Under these circumstances the patient must be compelled to take small quantities of beef tea and milk at frequent intervals, and in this way a considerable amount.

of nutriment may be administered. If this is persevered in for a short time, the patient generally becomes able to swallow easily, and there is a marked effect for good produced on the ulceration. At the same time a good quantity of port wine should be given in similar small doses. If deglutition is really impossible, nutrient enemata must be employed.

When there is much dyspnoea accompanying throat ulceration, most careful watching is needed, as remarkably sudden death may occur from suffocation, and laryngotomy or tracheotomy may be called for at a moment's notice. Indeed in some of these cases it is decidedly advisable to open the larynx as a precautionary measure, so as to prevent any danger of sudden death, and at the same time to leave the ulcerated parts in a state of rest, and therefore in a more favorable condition for undergoing the healing process.

III. CHRONIC AFFECTIONS OF THE THROAT.

1. CHRONIC PHARYNGEAL CATARRH.—This is a very common condition, the symptoms being uneasiness or soreness of the throat, increased by irritating substances; roughness or huskiness of the voice; a frequent desire to clear the throat; cough, especially in the mornings, there being much difficulty in removing the secretion which forms. Examination reveals redness, frequently with permanent enlargement of the vessels; a rough, granular appearance (granular sore throat); or numerous enlarged follicles (follicular sore throat); or raised hard papules of a considerable size; generally much thick sticky secretion; and superficial erosions or ulcerations, or follicular ulcers. Chronic pharyngeal catarrh is often associated with disorders of the stomach, phthisis, chronic alcoholism, excessive smoking, too much talking or singing, or a relaxed uvula.

2. RELAXED MUCOUS MEMBRANE is frequently the cause of unpleasant throat symptoms, and it either follows catarrh, or is associated with general debility. A quantity of secretion forms on the surface, giving rise to cough. A relaxed and elongated uvula induces very uncomfortable sensations, with a tickling cough, which comes on particularly when the patient lies down at night, owing to the uvula falling back and causing irritation. It may excite nausea and vomiting.

3. CHRONIC ENLARGEMENT OF THE TONSILS.—Enlargement of the tonsils beginning during very early life is liable to lead to serious results, and therefore, when examining children, it is always desirable to ascertain the condition of their tonsils, especially if they are rickety, tubercular, or strumous. Its pathological causes are: 1. Chronic inflammation, either following acute tonsillitis, especially after several attacks, or coming on gradually. 2. Persistent or frequently-repeated congestion. 3. Albuminoid infiltration.

The chief symptoms are difficulty of deglutition and alteration of voice. Breathing is not uncommonly interfered with, and the report frequently is "that the child makes a great noise when asleep," snoring loudly. In course of time deformity of the chest may result from the obstruction to the entrance of air. Deafness is not an unusual symptom. On inspection the tonsils are seen to be more or less enlarged, and they may meet in the middle line. There is no particular redness, but the surface appears granular or irregular, and white opaque accumulations of secretion are often observed upon it. The tonsils feel hard. The general health is in most cases below par, and nutrition is interfered with, so that growth and development do not proceed properly. Tonsils chronically enlarged may be liable to acute exacerbations from time to time.

4. Polypi and various growths, benign or malignant, are in rare instances met with in the throat. They cause more or less obstruction, and their nature is revealed on examination.

DIAGNOSIS.—All that need be said here is that chronic affections of the throat may be simulated in nervous people when there is nothing really wrong; and that symptoms attributed to other diseases are not uncommonly due to some abnormal condition of this part which has been overlooked. This remark applies particularly to cough. The habitual examination of the throat will guard against this error.

PROGNOSIS.—Chronic throat complaints are not often dangerous in themselves, but they frequently cause much annoyance, and may be very difficult to get rid of.

TREATMENT.—In treating any chronic throat affection, it is requisite first of all to find out its cause, and remove this, if possible. Intemperance in drink; excessive smoking; the habitual use of hot spices and condiments in excess; or too much speaking in public or singing, must be put a stop to. At the same time it is often important to improve the general health by careful attention to hygiene and diet, especially in the case of children suffering from enlarged tonsils, for whom a change to the seaside is very beneficial. If the alimentary canal is out of order it must be attended to. The internal administration of quinine and iron; acids with bitter infusions; or *nux vomica* or *strychnia*, frequently does much good. Steel wine and cod-liver oil are very useful in cases of enlarged tonsils.

Local treatment is essential. The regular and efficient employment of astringent applications is generally called for, in the form of gargles, glycerins or solutions applied with a brush, spray, lozenges, or powders. The most serviceable topical remedies are alum, tannin, dilute mineral acids, tincture of capsicum, catechu, tincture of steel, sulphate of zinc, or nitrate of silver. Infusion of roses with dilute sulphuric acid and tincture of capsicum constitutes an agreeable and useful gargle. Glycerin of tannin is a very efficient application in many chronic conditions

of the throat. It may be necessary to puncture follicles, and then touch them with nitrate of silver; or to snip off an elongated uvula. When the tonsils are enlarged, the regular application of strong glycerin of tannin, nitrate of silver, or tincture of iodine may be tried, but generally these are quite ineffectual, and the tonsils have to be excised. After excision, it is necessary to see that they heal properly, as they are apt to remain in a painful state for some time. If the chest is becoming deformed, there should be no delay in removing the tonsils. Growths may need excision.

IV. RETROPHARYNGEAL ABSCESS.

This is a very rare affection, which may be either acute or chronic, and occurs under the following circumstances: 1. As a complication or sequela of the acute specific fevers. 2. In pyæmia. 3. As the result of local injury or disease, *e. g.*, caries of the cervical vertebræ, or disease of the laryngeal cartilages. 4. Extremely rarely as the termination of a primary inflammation.

SYMPTOMS.—These are pain at the back of the pharynx; much difficulty in swallowing, food and drink returning by the nose; alteration in the voice; cough; and often great dyspnoea, with a sense of suffocation. The abscess may be seen or felt in the pharynx, or it may form an external enlargement, and after a time fluctuation can be detected in most instances.

TREATMENT.—This consists in at once letting out the pus by careful incision; and keeping up the patient by nutritious diet, stimulants, and tonics.

CHAPTER III.

DISEASES OF THE ŒSOPHAGUS.

CLINICAL CHARACTERS.—The clinical phenomena which are to be looked for as indicative of œsophageal affections are: 1. The existence of pain, which generally seems to lie deep in the chest, as if between the shoulders, and fixed in some particular spot; or of other abnormal sensations, such as fulness, tightness, oppression, burning, or obstruction by a foreign body. 2. Pain or difficulty during deglutition. When this symptom is noticed inquiry must be made with regard to its degree; whether the difficulty can be overcome by repeated efforts; if it can be localized in any particular spot; whether it has come on gradually and steadily increased or suddenly, and if it is constant or only paroxysmal, associated or not with the taking of food; if it is influenced by the liquid or solid character of things swallowed, the size of solids, hot or cold substances, or special articles of diet; whether the act is aided by any particular position. 3. Rejection of various substances,

such as food, mucus, blood, exudation, pus, etc., either by mere regurgitation, spasmodic action, or vomiting. This may occur immediately after taking food, or after an interval, a large quantity being then discharged, as if the materials had been accumulating for some time. Food which has remained in the œsophagus instead of entering the stomach has an alkaline reaction, and is macerated and decomposed instead of having undergone the digestive process.

4. *Physical examination* often aids materially in the investigation of œsophageal affections. This includes: *a.* A full inspection of the throat. *b.* The passage of an œsophageal bougie, which must be done cautiously. By the use of this instrument important information may be obtained. (i.) It enables the practitioner to ascertain if there is any actual obstruction, as well as its seat and degree; also whether this is constant and increasing, or only present from time to time, and if it can be overcome by continuous moderate pressure, yielding more or less suddenly. (ii.) Should there be obstruction, the actual shape of the obstructed part may be known by making the bougie warm and soft, and thus getting a mould of the passage. (iii.) Frequently the bougie brings up materials on its surface, such as blood, pus, cancer-cells, etc., which should then be examined microscopically. (iv.) Occasionally the bougie may be felt to pass round something, such as a polypus. *c.* Auscultation. This is sometimes useful, for when the stethoscope is applied in the course of the œsophagus behind, and the patient made to swallow, a sound may be produced, should any obstruction be present, as if something were passing through a narrowed portion into a wider part beyond. Dr. Clifford Allbutt has recently drawn special attention to the value of œsophageal auscultation. *d.* External examination: (i.) For any swelling in the neck or elsewhere in the course of the gullet, which might indicate dilatation or sacculation of this tube; at the same time noticing whether any such enlargement is influenced by taking food or drink, or by the act of vomiting or retching. (ii.) For any tumor in the neck or chest likely to influence the functions of the œsophagus by pressure.

I. ACUTE ŒSOPHAGITIS.

ETIOLOGY.—Œsophagitis may arise: 1. As a simple catarrhal inflammation, along with catarrh of other mucous membranes. 2. From direct injury by foreign bodies. 3. From irritation or corrosion by chemical substances, such as acids, alkalies, corrosive sublimate; also by very hot or cold articles. 4. By extension of thrush or diphtheria, when the characteristic deposits are met with. 5. As a complication of the specific fevers, cholera, pyæmia, and other acute affections. 6. In connection with organic disease, as ulcer or stricture.

ANATOMICAL CHARACTERS.—There are the usual signs of inflammation, viz., redness and swelling of the mucous membrane, with loss of consistence, and various deposits on the surface, according to the nature of the inflammation. Occasionally ulceration is seen, and superficial erosions are common; if the inflammation is caused by corrosives there may be much destruction of tissue. As a rare event pus forms beneath the mucous membrane.

SYMPTOMS.—More or less pain is felt deep in the chest, along the course of the œsophagus, which may extend to the epigastrium. If there is ulceration, the pain is very severe at this spot. Deglutition is

difficult and painful, food and drink being ejected either immediately by spasm, or subsequently by vomiting, along with much mucus or sometimes with blood, pus, membranous shreds, or casts. In severe cases there may be great distress, with a marked sense of oppression about the chest. The general symptoms are of a febrile character, and there is much thirst. Should the œsophagus be corroded or ulcerated, perforation may possibly take place, indicated by its special symptoms.

TREATMENT.—In mild cases no special treatment is required. In severe forms of œsophagitis all that can be done is to let the patient suck ice freely; give only liquid and mucilaginous diet in small quantities, or if there is corrosion, employ nutrient enemata, so that the œsophagus may be left entirely at rest; apply hot fomentations externally; and administer opium to relieve pain and procure rest.

II. CHRONIC DISEASES OF THE ŒSOPHAGUS.

These are of much importance, and may be described under: A. Functional derangements. B. Organic diseases.

A. *Functional Derangements.*

1. **PARALYSIS.**—This extremely rare condition is met with only in certain nervous affections, viz., general paralysis of the insane; progressive muscular atrophy; some cases of brain disease; the paralysis which follows diphtheria; hysteria; or in glosso-laryngeal paralysis.

SYMPTOMS.—Dysphagia is the only symptom, which is particularly felt with regard to liquids, these tending to pass into the larynx. Solids, and especially large pieces, are more easily swallowed, and the erect posture facilitates the act of deglutition. The bougie can be passed quite readily.

2. **ŒSOPHAGISMUS OR SPASM.**—A slight degree of œsophageal spasm is not at all infrequent, and sometimes it gives rise to much distress, inducing complete obstruction.

ETIOLOGY.—The causes of œsophagismus are—1. Most commonly some nervous condition, especially hysteria and hypochondriasis. 2. Brain disease, very rarely. 3. Local irritation, especially that of an ulcer. 4. Occasionally dyspepsia with flatulence. 5. External pressure on the nerves of the œsophagus. 6. Intemperance.

SYMPTOMS.—There may be a constant feeling of obstruction in some fixed point, as if a foreign body were impacted, but pain is absent. When food is taken, sudden dysphagia comes on and a stoppage is felt at a certain spot, either absolute and complete, or yielding after several efforts have been made to swallow, this event often occurring equally suddenly. The attacks are not always constant, for at times deglutition may be effected comfortably. The act is often influenced by the nature

and temperature of the food. Usually much discomfort is felt during the attempts at swallowing, with a sense of oppression or suffocation, and sometimes spasmodic movements of the muscles of the neck are excited. On attempting to pass a bougie its progress is stopped, but after careful continued pressure the spasm gives way, sometimes suddenly, and the instrument passes on. In the cases which have fallen under my notice the upper part of the canal was affected, but the lower end may be involved. Dyspeptic symptoms are frequently complained of, especially flatulence and eructations, which may bring on the spasm. There are no signs of wasting or of serious organic disease as a rule, but generally the patient is distinctly hysterical or hypochondriacal. Should œsophagismus be due to a tumor pressing on its nerves, this will probably yield physical signs of its presence.

B. Organic Diseases.

1. CHRONIC ULCERATION.—An ulcer is occasionally seen in the œsophagus, presenting similar characters to those to be hereafter described in connection with the stomach. It is liable to give way and cause perforation.

SYMPTOMS.—Usually much localized pain is experienced, of a burning character. Deglutition is very painful and difficult or impracticable, chiefly on account of spasm, and this is sometimes the only symptom. Blood and mucus may be expelled, or brought away on the bougie. Great care must be exercised in using this instrument if there is any reason to suspect ulceration.

2. STRICTURE AND OBSTRUCTION.—The conditions which may cause permanent narrowing or complete closure of the passage of the gullet may be thus enumerated :

(i.) *Organic changes in its walls, viz.:* *a.* Cancerous infiltration. *b.* Cicatricial thickening and contraction after wounds, ulcers, or corrosion. *c.* Hypertrophy of the coats, especially the submucous cellular tissue; or exudation and thickening as the result of chronic inflammation. *d.* Syphilitic growths. *e.* Ulceration with induration and swelling of the margins of the ulcer.

(ii.) *External pressure from—**a.* An enlarged thyroid gland. *b.* Enlarged lymphatic glands in the neck or chest. *c.* Various tumors or growths in the neighborhood, such as cancer, fibrous tumors, exostoses; as well as aneurisms and abscesses. *d.* Great distension of the pericardium by fluid.

(iii.) *Growths projecting inwards from the walls of the œsophagus or from outside, these being generally cancerous, fibrous, or of the nature of polypi.*

RESULTS.—After a time the gullet becomes dilated and hypertrophied above the seat of any obstruction, and in this distended portion food

is apt to accumulate, causing irritation, ulceration, and sometimes perforation. The mucous membrane is also liable to ulcerate at the point of stricture. Below this point the tube usually becomes narrowed and atrophied.

SYMPTOMS.—Dysphagia is the chief symptom of organic obstruction, and a feeling is experienced as if the food always stops at a certain spot, which in the great majority of cases lies behind the upper piece of the sternum. At first the difficulty is only slight, but it increases, usually slowly, until at last nothing whatever will pass. Liquids and soft pulpy substances are far more easily swallowed than solids, especially when these are in large pieces, hence the patients learn to chew their food thoroughly. If a good-sized lump can be got through the obstruction things will then pass more readily for a time. Food is either immediately regurgitated or spasmodically rejected; or it is retained in a dilatation for some time and then discharged in large quantities, being almost always alkaline, as well as sodden and decomposed. A good deal of mucus is brought up, and sometimes blood or pus if there is ulceration. Pain is frequently absent or very slight, but if cancer or an ulcer is present it is commonly severe. A sense of pressure and weight in the chest is often complained of. If the obstruction is seated near the lower end of the œsophagus, the symptoms may appear to be associated with the stomach.

In proportion to the difficulty experienced in taking nourishment will be the degree of emaciation and weakness, which are in many cases extreme, the abdomen becoming greatly retracted, and the patient exhibiting all the signs of starvation, at the same time being often very hungry and thirsty.

The use of the bougie gives accurate information as to the actual existence, position, degree, shape, and rate of progress of any stricture or obstruction. It may also reveal its cause by the substances it brings up. Auscultation may give some aid in diagnosis. A tumor usually gives rise to symptoms of pressure on surrounding structures, as well as to external physical signs.

3. CANCER.—It is requisite to make a few additional remarks with regard to this extremely rare disease. Males and persons of advanced years are the subjects in whom it usually occurs.

ANATOMICAL CHARACTERS.—The upper end of the œsophagus is involved in most cases, then the lower, and only very exceptionally the middle part. All forms of cancer are met with, the epithelial variety being most frequent above, and the scirrhus near the cardiac orifice; the growth may infiltrate the coats and extend through the entire circumference, or form a distinct tumor. The affected part is thickened, constricted, hard, and irregular, and ulceration of the mucous surface is liable to occur. The submucous tissue is that in which the formation

is first observed. The glands in the neighborhood are generally cancerous, but other organs are not often affected.

SYMPTOMS.—In addition to symptoms pointing to obstruction, there is much pain, generally localized, but also shooting along the side, upwards, or backwards between the scapulæ. The bougie may bring up cancer-cells, or these may be rejected. Signs of pressure are usually evident, especially dyspnœa. Dyspeptic symptoms, with pyrosis and eructations, are common, and may be present for some time before any local signs appear. Great wasting and debility are generally observed, with œdema of the legs; and the cancerous cachexia may be well marked. Œsophageal cancer has almost always a short duration, the average being about thirteen months.

4. DILATATION OR POUCHING.—This condition may affect the whole circumference of the gullet; or form a hernia or sacculum on one side. It arises from—(i.) Some obstruction most commonly. (ii.) Lodgment of a foreign body. (iii.) Paralysis from chronic catarrh. (iv.) No evident cause. It may form a tumor in the neck, influenced as to its size and other characters by taking food or drink, or by vomiting. Substances collect in it, and are then discharged at variable intervals.

5. PERFORATION.—The Œsophagus may be perforated from within, as the result of ulceration, cancer, corrosive destruction, or injury by a foreign body; or from without, by aortic aneurism, abscesses, glandular or other tumors. The perforation may take place into various parts, and the symptoms will vary accordingly. It is generally accompanied with signs of collapse.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF CHRONIC ŒSOPHAGEAL DISEASES.

DIAGNOSIS.—When a case occurs in which symptoms point to the Œsophagus, the diagnosis has to determine: 1. Whether this tube is organically or functionally affected; or is interfered with by some neighboring growth. 2. The nature and origin of the disease—if organic, whether cancerous, etc.; if functional, whether of the nature of paralysis or spasm. 3. The seat of the morbid condition, as regards the part of the tube involved.

It is often very difficult to determine what the actual state of things is, and in order to arrive at a correct diagnosis the following points must be carefully taken into account: 1. The history of the patient and his family; the conditions as regards age and other circumstances; as well as the history of the complaint, with respect to its cause, previous duration, and course. 2. The general state of the patient, especially as to the degree of emaciation and debility, and the presence of any diathesis. 3. The degree, characters, and situation of the local symptoms, particular attention being paid to deglutition, from which

much information may be gained. 4. The knowledge conveyed by the use of the bougie, which is often very accurate and decisive; as well as by the other modes of physical examination, especially to determine whether tumors exist in the vicinity of the œsophagus. 5. If any signs of adjacent pressure are present. 6. The state of the nervous system. 7. The condition of the stomach. 8. The progress of the case. The descriptions already given will sufficiently indicate how the different diseases differ in these respects.

PROGNOSIS.—Spasmodic affections of the œsophagus are not dangerous as a rule, but they are often exceedingly difficult to cure. Paralysis is very serious in most cases, being a part of some grave nervous disease. In all organic diseases the diagnosis is highly unfavorable. In ulceration the chief dangers are from perforation, or from stricture after healing. Every form of obstruction involves an unfavorable prognosis, and when cancer exists a speedy termination may be foretold. In some conditions which cause obstruction the prognosis depends partly on the results of treatment.

TREATMENT.—1. The general condition of the patient must be attended to. If an hysterical condition is evident, assafoetida, aloetics, iron, and valerianate of zinc are indicated. In the serious nervous disorders strychnine and electricity are of most service, but generally no good can be done. Proper dieting is most essential if there is any real obstruction; liquid or pulpy nourishing food must be administered in sufficient quantities, and the patient should be fed at intervals through a stomach-pump. At last nutrient enemata have generally to be used, and, should there be ulceration, they are decidedly indicated at an early period, so that the ulcer may not be irritated, and may be allowed to heal. Any special diathesis, such as syphilis, must have its appropriate remedies. Dyspeptic symptoms frequently require attention. The strength must be kept up by tonics, cod-liver oil, and stimulants, as well as by food. 2. External local applications sometimes do good in œsophagismus, such as a blister over the sternum, a belladonna plaster, or friction with belladonna liniment. Probably these act through a mental influence. No local treatment has any effect in the other conditions. 3. The bougie is most valuable in treatment as well as in diagnosis. The threat of its use sometimes does good in spasmodic cases, and its regular employment often leads to much improvement. By its aid strictures can often be dilated, but great care must be exercised in performing this operation, especially if an ulcer is present. 4. Various symptoms, such as pain, sleeplessness, or vomiting, frequently call for special treatment by means of opium, morphia, or other narcotics, local heat, ice, and other remedies. 5. In some instances the advisability of performing œsophagotomy or gastrotomy has to be considered.

CHAPTER IV.

DISEASES OF THE RESPIRATORY ORGANS.

CLINICAL CHARACTERS.—The clinical phenomena associated with the respiratory organs vary in their precise characters according to the part affected and the nature of the disease; but the following outline may serve to indicate their main features.

1. Morbid sensations are very commonly complained of. When the larynx or trachea is involved, these sensations are referred to this portion of the respiratory tract, the chief being mere uneasiness, soreness, actual pain of variable characters, a sense of burning, irritation, or a feeling as if a foreign body were present. They are often increased by acts causing local disturbance, such as coughing, speaking, or singing. There may be external tenderness over the larynx, especially on making pressure directly backwards. In affections of the bronchi, lungs, or pleura, pain is generally experienced over some part of the chest, with regard to which it is always important to observe the effects of cough and deep inspiration. 2. Breathing is frequently disturbed in some way or other, there being some form of dyspnoea. Any obstruction in the main air-tube causes serious interference with respiration, and hence in laryngeal and tracheal diseases breathing is frequently noisy, hissing, whistling, or stridulous, prolonged and labored; while there may be signs of urgent dyspnoea, with indications that little or no air enters the lungs during inspiration, especially in the case of young children. In some conditions expiration is undisturbed. Laryngeal dyspnoea may be constant or only paroxysmal, sometimes coming on very suddenly, and being always liable to exacerbations. As regards other portions of the respiratory apparatus, the character of the disorder of breathing will vary with the nature of the disease. 3. Certain acts are excited which have for their object the removal of some source of irritation in connection with the respiratory tract. The most important of these is cough, but sneezing and hawking also come under this head, the former being excited by some irritation in the nasal passages, the latter by a similar condition in the larynx or throat. Cough differs in its characters according to its cause. Laryngeal cough is peculiar and characteristic, being irritable, and liable to come on in distressing fits; difficult to repress; hard, hoarse, cracked, croupous, metallic, barking, or aphonic. In many cases of laryngeal disease there is a constant desire to cough or hawk, in order to get rid of a feeling of some obstruction. 4. The expulsive acts just alluded to are frequently attended with the discharge of various substances, technically termed *expectoration* or *sputa*. These may consist of mucus, muco-purulent matter, pus, croupous or diphtheritic exudations, portions of morbid structures or of the tissues of the air-passages or lungs, calcareous particles, or other materials. 5. Hæmoptysis or spitting of blood demands notice as a special form of expectoration, this being a symptom of considerable importance. 6. The voice is liable to more or less alteration in its characters when the larynx is implicated. It may be weak to complete aphonia; altered in quality, being rough, harsh, hoarse, croupy, or cracked; or changed in pitch or range. 7. Occasionally the expired air presents normal characters. 8. In diseases affecting the larynx deglutition may be somewhat uneasy or painful, and if the epiglottis is destroyed the act is difficult, things being apt to pass into the air-passages. In exceptional cases of certain lung-affections the patient may also experience some difficulty in swallowing, this being probably

due to nervous disturbance. 9. The general aspect and posture of the patient often afford important indications in connection with diseases of the respiratory organs, and therefore should always receive particular attention.

PHYSICAL EXAMINATION.

Physical examination constitutes an essential and most important part of clinical investigation directed to the respiratory organs, and the subject therefore needs to be discussed as fully and completely as the limits of this work permit, though it will be impossible to enter into lengthy details.

A. Examination of the Larynx and Trachea.

Physical examination directed to the investigation of morbid conditions affecting the larynx or trachea includes :

a. External examination of the neck, which, for example, may reveal the presence of any tumor interfering with the main air-tube, or a fistulous communication with this part. Direct examination over the larynx and trachea, by means of palpation and auscultation more especially, may also be useful, the latter detecting any alterations in the breath-sounds, or revealing local rhonchi.

b. Examination of the throat internally. Much information is often gained by inspecting this part with a good light, there being in many cases similar morbid conditions affecting the throat and larynx. The state of the epiglottis can also be frequently made out in this manner, or it may be felt by the finger.

c. Examination of the chest, which will show whether there is any obstruction to the entrance of air into the lungs; or if there is any tumor in this region disturbing the functions of the air-tubes.

d. Examination with the laryngoscope. The laryngoscope is specially employed for determining the state of the upper part of the windpipe, and although it is possible in many instances to come to a tolerably accurate conclusion on this matter without its aid, yet by it alone can the exact conditions present be ascertained. It is also useful for the purpose of applying local remedies and performing operations. Much practice is required before the instrument can be effectually made use of.

The laryngoscope consists of an apparatus for illuminating the back of the throat; and a small mirror, which is introduced into this region in such a way as to reflect an image of the interior of the larynx. Illumination is usually effected by reflection, a mirror being attached to the observer's head in various ways, which is made to reflect either solar light, or, more commonly, that derived from some artificial source. Numerous lamps have been invented, of which one of the best is the "rack-movement lamp" of Dr. Morell-Mackenzie; but any lamp which

yields a clear, strong, and steady light, will suffice for ordinary purposes. Some employ direct illumination by means of a lamp placed on a narrow table between the operator and the patient, having a powerful lens directed towards the latter, and being screened towards the former. The oxyhydrogen light answers best in this way. The throat-mirrors are generally circular, varying in diameter from half an inch to an inch, but, if the tonsils are enlarged, oval or ovoid mirrors may be employed. They ought to be made of glass backed with a coating of silver, mounted in German silver, and fixed at an angle of about 120° to a slender shank which is inserted into a handle.

Mode of Examination.—The patient sits opposite the observer, with the head inclined very slightly backwards, an interval of about a foot being left between their faces. The lamp is placed at the side of the patient, the flame being on a level with the eyes. The mouth being opened as widely as possible, and the tongue protruded, this is held gently between the thumb and forefinger of the left hand, covered with a handkerchief or a soft napkin. By means of the reflector the light is then directed to the back of the throat, so that the centre of the disk corresponds to the base of the uvula. The throat-mirror, having been properly warmed over the lamp, is now introduced, being held between the thumb and fingers of the right hand; the reflecting surface is directed more or less obliquely downwards, while the opposite one touches the base of the uvula, which should be pushed gently upwards and backwards. In order to facilitate the introduction of the mirror it is often necessary to make the patient take a deep breath, or repeat the sound "ah." Some persons can bear examination for any length of time if it is properly conducted, but in most cases it is better to introduce the mirror several times in succession for a few seconds each time.

It is requisite to become familiar with the appearances observed with the laryngoscope in the healthy larynx before this instrument can be made use of in investigating diseased conditions. The morbid conditions which may be detected are: 1. Changes in color, due to congestion, inflammation, or other causes. 2. Alterations in the size, shape, and position of the epiglottis. 3. Thickening of tissues with irregularity, resulting from chronic inflammation. 4. Swelling from œdema. 5. Various deposits, especially croupous. 6. Ulcerations. 7. Growths and tumors. 8. Changes in the shape and size of different parts, particularly of the opening of the glottis. 9. Derangement of the action of the muscles of the glottis, as observed during the act of breathing or vocalization.

B. Examination of the Chest.

Physical examination of the chest includes that of its walls and of its several contents. The present section will be devoted to a consideration of the subject so far as it applies to the respiratory apparatus;

other structures must, however, be alluded to more or less, but the examination of the heart and vessels will be treated of separately in a subsequent chapter.

There are some general practical hints to which it is desirable to call attention at the outset. 1. A knowledge of the anatomy and physiology of the thorax and its contents is most essential before physical examination can be applied to the investigation of any morbid condition in connection with them. It is also requisite to be familiar with the normal physical signs, it being borne in mind that these are influenced by the liver and spleen, which invade upon the limits of the chest, and hence students should first practice examining healthy individuals. 2. When investigating for disease, the chest should be exposed to the full extent that any individual case may require. It is often necessary to strip the chest and upper part of the abdomen completely, and in the case of males and children there need be no hesitation about doing this; the examination of females must of course be conducted with due regard to decency. To make a practice of examining through garments is most objectionable. 3. The patient should assume an appropriate position, the objects aimed at being to place the superficial structures under such conditions that they will not interfere with the production or perception of the physical signs; and to enable the operator to conduct the examination in a comfortable and unrestrained attitude. Ordinarily, when the front of the chest is being examined, the patient should sit or stand with the hands hanging down by the side. A slightly stooping posture, with the head bent forward and the arms well folded across the chest, so that the scapulae are drawn away from the spine and the muscles are put on the stretch, answers best for examining the back. The sides are most conveniently reached by having the arms raised vertically above the head. 4. The investigation ought to be carried out thoroughly and completely whenever circumstances seem to require this, every part of the chest being explored. Certain regions, however, demand special attention, viz., those corresponding to the apices of the lungs, both in front and behind; to their bases posteriorly and laterally; and to the heart and great vessels. 5. It is most desirable that the examination should be conducted in a systematic and orderly manner. The different methods should be gone through in regular succession, the lungs being first attended to, and then the heart and vessels. In many cases it is advisable to complete the examination of a particular region before proceeding to another part of the chest. It must be remembered that the various structures within the thorax mutually affect each other's physical signs, and that examination of one organ may aid in detecting some morbid condition in another. 6. Repeated examination may be needed before a satisfactory diagnosis can be arrived at. In many acute cases also the physical signs should be noted at frequent intervals, in order to observe their progress; while in those affections

which are known to have a tendency to implicate the thoracic organs, these must be investigated as often as the nature of the case seems to require. 7. Certain conditions which influence the physical signs both in health and disease must always be taken into account. These are the state of the chest-walls as regards the amount of fat and muscle, and the conditions of the ribs and cartilages; the form of the thorax; the part over which the examination is made; the age and sex of the individual examined; the state of the nervous system, nervousness and hysteria materially affecting the respiratory and cardiac actions; the manner in which breathing is carried on, many persons needing instruction as to how to perform this act; the amount of air contained in the lungs, according to the stage of the respiratory act as regards inspiration and expiration. 8. When examining opposite sides with the view of comparing them, care must be taken that the examination is made over corresponding regions, and in precisely the same manner. 9. A preliminary acquaintance with the principles or theory of physical examination is highly desirable, but the student must remember that by long-continued experience alone can he become thoroughly grounded in the practical application of these principles. 10. Physical signs are but indications of certain physical conditions; and, therefore, in order to appreciate the significance of the signs elicited in any particular disease, the abnormal physical conditions associated with such disease must be clearly understood.

DIVISIONS OF THE THORAX.—For the purpose of describing the situation and limits of physical signs, certain imaginary lines are drawn on the chest, and regions marked off, the chief of which are as follows:

I. Lines. These are drawn vertically from the top to the bottom of the chest, and are named according to their position: 1. Mid-sternal. 2. Right and left lateral sternal. 3. Nipple or mammary line. 4. Acromial, from the acromion process. 5. Mid-axillary. 6. Scapular, along the vertebral border of the scapula. 7. Mid-spinal.

II. Regions. These may be arranged as follows:

1. Median, corresponding to the width of the sternum. *a.* Suprasternal, corresponding to the depression above the sternum. *b.* Upper sternal, extending to the lower border of the third cartilage. *c.* Lower sternal, from the third cartilage to the lower end of the sternum.

2. Antero-lateral, bounded internally by the margin of the sternum; externally by the acromial line on each side. *a.* Supraclavicular, including the space above the clavicle, and bounded superiorly by a line from the outer third of this bone to the trachea. *b.* Clavicular, corresponding to the inner half or two-thirds of the clavicle. *c.* Infraclavicular, limited below by the lower margin of the third rib. *d.* Mammary, from the third rib to the sixth. *e.* Inframammary, from the sixth rib to the lower margin of the thorax.

3. Lateral, bounded in front by the acromial line; behind by the

axillary border of the scapula. *a.* Axillary, from the apex of the axilla down to a line continuous with the lower boundary of the mammary region. *b.* Infra-axillary, from the above line to the lower margin of the thorax.

4. Posterior, from the axillary edge of the scapula to the middle line behind. *a.* Supraspinous or superior scapular, corresponding to the supraspinous fossa of the scapula. *b.* Infraspinous or inferior scapular, opposite the infraspinous fossa. *c.* Infrascapular, below the scapula to the margin of the thorax, and extending internally to the spine. *d.* Interscapular, including the space between the base of the scapula and the spinous processes of the corresponding dorsal vertebræ.

METHODS AND OBJECTS OF PHYSICAL EXAMINATION.—It is necessary to have a clear comprehension of the different methods of examination employed, with regard to their nature; the manner in which each is performed; and what it is capable of teaching; therefore a brief outline of this part of the subject will now be given.

I. INSPECTION.—This merely means “the act of looking,” and all that need be said about it is, that different views of the chest must be taken, from the sides and behind as well as from the front, a good light being employed. Inspection reveals: 1. The state of the superficial parts, as regards color, œdema, amount of fat, fulness of the veins, etc. 2. The shape and size of the thorax, along with which may be noted the state of the suprasternal and supraclavicular depressions; the direction of the ribs; the characters of the intercostal spaces; the size of the costal angles (*i. e.*, the angle between the ensiform cartilage and contiguous rib-cartilages on each side); and the relative height of the shoulders. 3. The frequency, extent, and characters of the respiratory movements.

II. PALPATION OR APPLICATION OF THE HAND.—The palmar surface of the hand and fingers is applied to the chest, in order to appreciate certain impressions which are capable of being conveyed by the sense of touch. In some cases it may be necessary to grasp the sides, particularly in children; in others only the tips of the fingers need be used, especially when it is desired to localize the signs; but generally it is best to feel with as much of the hand as can be applied. The objects of palpation are: 1. To give more accurate information as to what is revealed by inspection. 2. To determine the existence and characters of various kinds of *fremitus*. This term comprehends certain sensations conveyed to the surface, so that they can be felt, and which are classed as: (i.) *Vocal fremitus*, produced by the act of speaking or crying. (ii.) *Tussive fremitus*, originated by coughing. (iii.) *Rhonal fremitus*, due to the passage of air during the act of breathing through the air-tubes under certain physical conditions. (iv.) *Friction fremitus*, elicited by the rubbing together of roughened surfaces

of the pleura. 3. To detect the presence of any fluctuation, or succussion-movement.

III. MENSURATION OR MEASUREMENT.—In some cases it is important to obtain accurate information as to the size and shape of the chest, and the extent of the respiratory movements. For this purpose certain measurements are taken while the chest is at rest, and in different states as regards expiration and inspiration. The only measurements likely to be required are: 1. Circular or circumferential in different parts of the chest. 2. Semicircular, so as to compare the two sides. 3. Antero-posterior, in the middle line and on either side, especially under the clavicles; and transverse, noticing the relations of these two diameters. 4. Vertical, from the middle of the clavicle to the lower margin of the thorax. 5. Local, particularly from the nipple to the midsternal line; and to the clavicle on each side. The requisite instruments include an ordinary tape-measure; a double tape-measure made by uniting two so that they start from the same point, which is useful for comparing the two sides, the point of junction being applied to the middle line behind, and the tapes drawn round, one on each side of the chest, until they meet in the midsternal line; and different movable calipers, by which the diameters are taken. Several ingenious instruments have been invented for the purpose of indicating the respiratory movements very precisely, but they are of little practical value.

In some instances it is essential to get an outline of the shape as well as the size of the two sides of the chest in different parts, in order to determine the exact capacity of each, as this depends much on the form, the measurement being sometimes actually less on the side which has the larger sectional area and volume. This is accomplished by means of the *cyrtometer*, a convenient form of which consists of two portions of flexible lead-tubing of small calibre, united by a short piece of india-rubber tubing. The latter is fixed over the spine, and the two parts of lead-tubing are brought round the sides until they meet in the middle line in front. When the instrument is removed it indicates the shape as well as the size of each side, and the outline may then be traced on paper. Another kind of measurement which may be here mentioned is that by which it is sought to ascertain the actual capacity of the lungs, some form of *spirometer* being employed. At present this instrument is more of physiological interest than of practical value in diagnosis.

IV. PERCUSSION.—By this is meant “the act of striking,” and it affords signs of the highest value in diagnosis. There are two ways of performing percussion, viz., first, by striking the part under examination immediately, which is called *immediate* or *direct* percussion; secondly, by placing something on the surface, technically named a “pleximeter,” and percussing over this, which is termed *mediate* or *in-*

direct percussion. As a rule the latter mode should be employed, but the former is useful sometimes, especially when examining over bones, such as the clavicle. A great deal of discussion has been carried on as to the relative value of instruments or the fingers in percussion. Some use plates of ivory or other materials to place on the chest; and a light flexible "hammer" or "plessor" to strike with. Other instruments are also employed, but without entering into any discussion on the subject, I venture to express the opinion that the use of the fingers alone is much preferable, and answers every necessary purpose. The following description may give some notion as to how this mode of examination is to be conducted: First. One of the fingers of the left hand should be used as a pleximeter, especially the fore- or middle-finger, but the little finger is conveniently applied when percussing above the clavicle. It must be laid on evenly and firmly, with the palmar aspect next the surface. Secondly. Percussion must then be made with the ends of the fingers of the right hand, the nails being appropriately shortened. Some use all the fingers in this way, either arranged in a line or gathered into a cone with the thumb; others employ only three, two, or one. It is well to practice all methods, but ordinarily the fore- and middle fingers together answer best, or in light percussion the middle finger alone. Thirdly. The force employed must vary according to circumstances, but usually it should only be moderate. Fourthly. The stroke should be made perpendicularly to the surface; from the wrist; quickly and sharply; the fingers not being allowed to remain on too long.

The objects of percussion are to elicit—1. Certain sounds. 2. Different sensations as regards amount of resistance, elasticity, fluctuation, etc. These will be considered in detail later on.

V. AUSCULTATION.—This signifies the "act of listening," which may also be performed in two ways. The ear may be applied to the chest either directly or with only the intervention of a handkerchief or towel, which is termed *immediate* or *direct* auscultation; or the "stethoscope" may be employed as a medium of communication between the part to be examined and the ear of the operator, this constituting *mediate* or *indirect* auscultation. For many reasons the latter method should be practiced as a rule; but the former is often advantageously adopted, especially in the examination of children, and when listening over the back. It is impossible to enter here into any discussion with regard to the innumerable stethoscopes recommended. A great deal more depends on the ability to auscult and the knowledge of what is to be heard than on the kind of instrument employed; and any simple ordinary stethoscope answers perfectly well if the auscultator is competent. A convenient instrument is one made of a single piece of wood, such as deal or cedar, with a moderate sized hollow stem, a well-fitting slightly hollowed ear-piece, and rather a small chest-extremity, such as will fit

into the intercostal spaces. In using it care must be taken that the chest-end is applied in its whole circumference, without undue pressure; and also that the ear is properly placed on the ear-piece. During auscultation the stethoscope must not be held by the fingers; and care must be taken that it is not touched by clothing or any other article which might occasion abnormal sounds.

So far as the respiratory organs are concerned, the object of auscultation is to investigate sounds, viz.: 1. The *respiratory* or *breath-sounds*. 2. *Râles* or *rhonchi*, which are adventitious sounds originating in the lungs from certain abnormal physical conditions. 3. *Friction-sounds*, due to the rubbing together of roughened surfaces of the pleura. 4. Certain peculiar sounds, viz., *metallic tinkling*, *amphoric echo*, and the *bell-sound*, met with in rare conditions of the lungs or pleuræ. 5. *Vocal resonance*, or the sound produced during the act of speaking or crying; and *tussive resonance*, or that elicited by the act of coughing.

VI. **SUCCUSION.**—Rarely required; this mode of examination simply means “shaking the patient,” when a *splashing sensation* is felt, or a *splashing sound* heard in exceptional cases where a mixture of air and fluid exists in the pleural cavity.

VII. **DETERMINATION OF THE POSITION OF ORGANS, WITH THE VIEW OF DETECTING DISPLACEMENT** is ordinarily ranked as a special method of examination, but in reality it is merely a conclusion founded on the information derived from some of the other modes already considered. At the same time displacement of organs, both thoracic and abdominal, does often give most valuable aid in the diagnosis of abnormal conditions.

VIII. **THE USE OF THE ASPIRATEUR OR TROCAR** may be classed as a mode of examination, as these instruments sometimes afford most important aid in the diagnosis of morbid conditions within the chest.

Certain other modes of examination have been described, but at present they are not of sufficient practical value to call for notice in this work.

I. SHAPE AND SIZE OF THE CHEST.

The size and shape of the chest are ascertained by *inspection*, *palpation*, and *measurement*. They may be considered together, as they generally bear a close relation to each other, the thorax being larger the more it approaches the circular form; while both the capacity and shape depend considerably on the direction of the ribs and their relation to each other. In healthy children the thorax is comparatively large and nearly circular; in adults it is usually more or less elliptical during ordinary breathing, the long diameter being transverse. However, many diversities of form may be observed within the range of health, and though there ought to be no obvious want of symmetry between the two sides, slight differences can generally be detected.

(i.) *Deviations from the Normal not due to Existing Disease.*

1. The thorax may be small and contracted in its capacity, this condition being either congenital or acquired. Two forms of small chest are met with, viz.: *a.* That in which the ribs are very oblique and the spaces wide; the chest is long and narrow in all its diameters; the costal angles are very acute; whilst the scapulæ are often tilted up behind like wings, this form of chest having on this account been termed *alar* or *winged*. *b.* That in which the front of the chest is flattened, so that the antero-posterior diameter is very small.

2. Some important deformities of the chest are originated during the period of infancy and childhood, as the result of an insufficient amount of air entering the lungs during the act of breathing. This is due either to some obstruction in the air-passages; to a weak condition of the muscles which expand the chest; or to both these causes combined; and the deformities are more liable to occur in proportion to the yielding nature of the thoracic walls. When these conditions exist, sufficient air does not reach the lungs during inspiration to enable them to fill up the vacuum produced by the descent of the diaphragm, and hence the chest is driven in to a greater or less degree by external atmospheric pressure, being also partly drawn in by the action of the diaphragm, and possibly of other muscles. The chief causes originating obstruction are bronchitis, whooping-cough, laryngismus stridulus, croup, and chronic enlargement of the tonsils.

Four special deformities of the chest may be described.

a. Transversely constricted. This is a very frequent deviation from the normal, the front of the lower part of the chest presenting a more or less deep groove or depression, passing obliquely outwards and downwards from the ensiform cartilage.

b. Pigeon-breast. Here there is a falling in of the true ribs on each side, so that they become more or less straight in front of their angles, while the sternum is projected forwards. Hence a transverse section of the chest would be triangular, with the base behind and the apex in front. The ensiform cartilage is also frequently bent sharply backwards at its junction with the sternum, where there is therefore an angular prominence. More or less transverse constriction is always observed.

c. Anteriorly depressed. Occasionally the part of the sternum below the third cartilages is considerably depressed, so as to present a concavity of variable depth, carrying with it the contiguous portions of the rib-cartilages. In some instances this deformity is congenital, but by no means always.

d. Rickety. The true rickety thorax is very characteristic. It is flat posteriorly as far as the angles of the ribs, where there is a marked bend; on each side a groove runs obliquely downwards and outwards,

which may extend from the first to the ninth or tenth ribs, but is most marked about opposite the fifth, sixth, and seventh; this corresponds mainly to the line of junction of the ribs with their cartilages, which is indicated by a series of nodular swellings, but the bottom of the groove is formed more by the ribs than the cartilages. In front of it the cartilages are more or less curved, and the sternum is somewhat prominent, so that the antero-posterior diameter is increased. The greatest lateral diameter is opposite the angle of junction between the dorsal and lateral regions; and the shortest corresponds to the bottom of the lateral depressions. The solid organs underneath will influence the form of the rickety chest.

3. The thorax may be deformed as the result of occupation; the pressure of stays or belts; or previous injury to or disease of the ribs or spine.

(ii.) *Changes in Shape and Size due to Existing Disease.*

1. *General enlargement.* In this condition the chest is more or less expanded, approaching to the form and size it presents after a deep inspiration, or even going beyond this, so as to become "barrel-shaped." The enlargement may involve the whole length of the thorax, or only its upper part. *Causes.* a. Emphysema usually. b. Extreme double pleuritic effusion very rarely.

2. *General diminution.* This is the opposite of enlargement, and the thorax may assume either the alar or flattened form. It may result from phthisis, but the two sides are rarely contracted to an equal extent, while local depressions are usually observed in this disease.

3. *Enlargement of one side.* Whenever any difference in the two sides is supposed to exist, it is well always to take an accurate outline by means of the cyrtometer. An enlarged side is usually more rounded and appears short, with a long antero-posterior diameter and a large costal angle. The shoulder is raised, and the spine curved to the opposite side. *Causes.* a. *In connection with the pleura.* (i.) Pleuritic effusion in the great majority of cases. (ii.) Occasionally pneumothorax or hydro-pneumothorax. (iii.) Very rarely hæmothorax. b. *In connection with the lung.* (i.) Hypertrophy or distension of one lung. (ii.) Secondary cancer.

4. *Diminution of one side or Retraction.* The characters are the reverse of those observed in enlargement, the entire side appearing small and cramped, with the ribs aggregated together. *Causes.* a. In most instances pleuritic adhesions and thickenings, binding down the lung so that it cannot expand. In all cases of retracted side pleuritic adhesions are formed after awhile. b. Collapse of the lung from any cause. c. Changes in the lung-structure, diminishing its volume and

power of expansion, viz.: phthisis; chronic or interstitial pneumonia; primary cancer.

5. *Local enlargement or bulging.* This necessarily varies much in its site, extent, and form, and accurate measurement may be required to determine it. *Causes.* The most frequent and important causes of bulging of the chest are enlargements of the heart; pericardial effusion; and aneurisms of the great vessels, to which attention will be directed hereafter. The remaining causes, which are very uncommon, may be enumerated here, viz.: *a. Conditions of the pleura.* (i.) Empyæma pointing on the surface. (ii.) Localized or basic pleuritic effusion. (iii.) Localized pneumothorax. *b. Conditions of the lung.* (i.) Pneumonia at the base or apex. (ii.) A large phthisical cavity at the apex. (iii.) Localized emphysema. (iv.) Very rarely hernial protrusions. *c.* Mediastinal tumors; or occasionally enlarged glands growing down from the neck. *d.* Enlargements of the liver or spleen. *e.* Disease of the sternum or ribs, or of their investing periosteum; as well as superficial abscesses and growths.

6. *Local diminution or depression.* *Causes.* (i.) Phthisis, owing to the local changes in the lung and the accompanying pleurisy, especially in the supra- and infraclavicular regions. (ii.) Local pleuritic adhesions.

7. The *costal angles* and *intercostal spaces* are often altered in size, and the latter are frequently abnormally bulged or depressed, as the result of morbid conditions of the pleura. Anything that affects the size of the chest generally or unilaterally will necessarily influence that of the costal angle and intercostal spaces; and the latter will also be altered locally along with any local bulging or depression.

II. MOVEMENTS OF RESPIRATION.

The respiratory movements are also studied by *inspection*, *palpation*, and *mensuration*. When examining for disease it is necessary to observe them during ordinary and forced respiration.

Without entering into the physiology of the respiratory movements at any length, it will be advisable to call attention to the following practical points: 1. They are partly costal or thoracic; partly diaphragmatic or abdominal. The thoracic movements are made up during inspiration of elevation and expansion; during expiration of depression and retraction. 2. In health there is no obvious difference in the movements of the two sides. 3. In males and children the diaphragm and lower ribs chiefly act during breathing, the movements being abdominal; while in females the upper part of the chest moves most, and breathing is upper costal. During forced respiration the movements are mainly upper costal in all persons. 4. The ordinary number of respirations ranges from 16 to 20 per minute. 5. Expiration is slightly

longer than inspiration, in the ratio of about 12 to 10 in males, 14 to 10 in females. 6. The intercostal spaces in most parts become rather more hollow during inspiration; as well as the supraclavicular fossæ. This is especially seen when a deep breath is drawn, and the sinking of the spaces is best observed towards the lower and lateral part of the chest. 7. Inspiration is entirely effected by muscular action; expiration chiefly by the elasticity of the lungs and chest-walls, aided somewhat by muscular force, which is much more called into play during forced expiration.

ABNORMAL RESPIRATORY MOVEMENTS.

The deviations from the normal which the respiratory movements present, may be arranged in the following manner:

A. Alterations affecting the General Movements.

1. *Alterations in frequency.* The respirations may be counted either by watching the movements, or by applying the hand quietly over the epigastrium. Their frequency may be: (i.) *Increased.* *Causes.* *a.* Most conditions which interfere with the action of the lungs in any way, and give rise to any form of dyspnœa. *b.* Many cardiac affections. *c.* Certain nervous disorders, *e. g.*, hysteria. *d.* An unhealthy state of the blood, such as that present in anæmia or fevers. (ii.) *Diminished.* A slow rate of breathing is often noticed in apoplexy, narcotic poisoning, and some nervous derangements, *e. g.*, trance.

2. *General movements in excess.* The patient breathes deeply and with unusual force, the extraordinary muscles being brought into play; the range of movement is greater; and more air is changed. *Causes.* *a.* Anything that interferes with the functions of the lower part of the lungs, such as disease in itself, *e. g.*, pneumonia, congestion, œdema, bronchitis; accumulations in the pleuræ; or abdominal enlargements (ascites, enlarged liver). *b.* Cardiac diseases which impede the circulation of the blood, and hence interfere with its proper aeration. *c.* Certain abnormal conditions of the blood itself, such as anæmia and chlorosis.

3. *General movements deficient.* This deviation may be associated either with increased, normal, or diminished frequency. *Causes.* *a.* Anything that extensively obstructs the functions of the lungs, *e. g.*, capillary bronchitis, double pneumonia, or effusion into both pleuræ. *b.* Painful chest-affections, *e. g.*, acute pleurisy or pneumonia, pleurodynia, intercostal neuralgia. *c.* Rarely interference with the action of the respiratory muscles from spasm or paralysis. *d.* Certain conditions of the central nervous system, *e. g.*, narcotic poisoning and trance. *e.* Very rarely infiltration of the chest-walls with cancer.

4. *Altered relation between the thoracic and abdominal movements. (i.) Thoracic movements in excess from diminished action of the diaphragm. Causes. a.* Usually some accumulation in the abdomen, mechanically interfering with the descent of the diaphragm, such as ascites, flatus, or tumors. *b.* Conditions which render movement of the diaphragm or abdominal walls painful, especially peritonitis, but also diaphragmatic pleurisy, rheumatism, and inflammation of the diaphragm or abdominal walls. *c.* Extreme pericardial effusion. *d.* Paralysis of the diaphragm from any cause. *(ii.) Diaphragmatic and abdominal movements in excess. Causes. a.* Any condition which is attended with pain on bringing the chest-walls into play, *e. g.*, pleurisy, pleurodynia. *b.* Paralysis or spasm of the chest muscles. *c.* Obstruction in connection with the air-passages, preventing the entrance of a sufficient amount of air.

5. *Alteration in the ratio between the expansion and elevation movements of the ribs.* The only important deviation in this respect is a diminution in the expansion movement, which may amount to its complete absence. It is especially observed during forced breathing, when there may appear to be considerable movement, but none of the expansive kind. *Causes. a.* General emphysema, the lungs being already distended and the chest expanded to its utmost extent. *b.* Rigidity of the chest-walls. *c.* Anything within or external to the lungs, which either prevents them from acting, or interferes with the entrance of air, *e. g.*, consolidations, pleuritic accumulations or adhesions, pressure on the air-tubes.

6. *Alterations in the rhythm of the respiratory act.* Unequal and jerky breathing is often noticed in some nervous disorders, such as chorea and hysteria. The most important change in rhythm, however, is that in which the *relative length of inspiration and expiration becomes disturbed*, the former being more or less short and quick; and the latter prolonged, slowly performed, and often labored (*expiratory dyspnœa*). *Causes. a.* Diminution in the elasticity of the lung-tissue and chest-walls, which is particularly observed in emphysema with rigid chest. Expiration becomes then either entirely muscular, or far more so than in the normal condition. *b.* Some obstruction to the passage of air through the principal air-passages.

7. *Depression of the chest-walls. Inspiratory dyspnœa.* Instead of expanding during inspiration, the chest may fall in to a greater or less extent, especially at its lower part, producing either temporarily or permanently one of the forms of deformed thorax already described. This deviation is chiefly observed in children. *Causes. a.* Almost invariably some obstruction to the entrance of air into the lungs. The conditions to which such obstruction is mainly due are (i.) Bronchitis. (ii.) Hooping-cough. (iii.) Anything tending to occlude the larynx or trachea, *e. g.*, croup, œdema glottidis, laryngismus stridulus, pressure of a tumor or aneurism. (iv.) Enlarged tonsils or other impediment

about the pharynx. *b.* Occasionally, it is said, very rapid œdema of the lung or hydrothorax.

B. Alterations affecting Unilateral Movements.

1. *Inequality of the respiratory movements on opposite sides.* This is usually due to *deficient expansion* of one side, which may become quite motionless. *Causes.* *a.* Accumulations in one pleural cavity; or adhesions compressing the lung. *b.* Changes in the lung-tissue on one side, interfering with its inflation, *e. g.*, acute or chronic pneumonia, phthisis, cancer. *c.* Pressure on either chief bronchus by a tumor, air being thus prevented from passing into the lung. *d.* Painful affections of one side. *e.* Unilateral paralysis of the muscles occasionally. When the movements of one side are interfered with, those of the opposite side frequently become excessive, owing to the lung having to perform extra work.

2. *Altered relation of the abdominal to the thoracic movements on one side.* This is certainly observed occasionally, but it is not of much consequence.

3. *Unilateral inspiratory dyspnœa.* The chest-wall may fall in on one side during inspiration, owing to obstruction of a main bronchus.

c. Local Changes in Movement.

1. The common deviation met with is a *local deficiency*, in which both expansion and elevation are involved, but especially the former. The usual causes of this change are phthisis, and localized pleuritic adhesions.

2. Occasionally a *limited falling in* during inspiration is observed, due to obstruction of one of the smaller bronchial divisions.

D. Abnormal Movements of the Intercostal Spaces.

In pleuritic effusion, pneumonia, and other conditions which affect the movements of the chest, the intercostal spaces frequently do not exhibit their usual changes of form during the act of breathing, and in some instances of extreme pleuritic effusion an undulatory motion is perceptible. They are often motionless over the seat of local deficiency in movement.

III. EXAMINATION OF VARIOUS KINDS OF FREMITUS.

A. VOCAL AND CRY-FREMITUS. Vocal fremitus is investigated by applying the hand to the surface while the patient repeats the words "ninety-nine," or counts from one to ten. As already remarked, the cry answers the same purpose in children. The normal variations due to the quality of the voice; age and sex of the individual; state of the

chest-wall; and the part of the chest over which the examination is made, must be borne in mind. As a tubercular fremitus is more marked on the right than on the left side, especially over the apex in front.

The changes which may be observed in disease are:

1. *Change of Area.* This may be 1. *Increased in Extension* of the lungs from emphysema or hyperpneumia. 2. *Diminished*, when the lung is retarded by adhesions, or pushed aside by some solid mass, such as an enlarged heart.

2. *Change of Intensity.* 1. *Increased.* Causes. a. Consolidation of the lung from any cause, provided that the consolidating material is not too abundant or too hard to permit, and that it includes tubes containing air. Vocal fremitus is especially marked if at the same time the bronchial tubes are filled, or if cavities of certain characters exist in the lungs. Hence increased vocal fremitus is an important sign of pneumonia, pleuritis, chronic pneumonia with filled bronchi, some cases of cancer, and similar conditions. b. Consolidation of the lung from compression or collapse. c. Bronchitis, congestion or oedema of the lungs, and pulmonary apoplexy, but the fremitus is by no means constantly increased in these affections, and is of little importance.

2. *Diminished or Suppressed.* Causes. a. Separation of the lung from the chest-wall, by some intervening imperfectly-conducting material, such as air in a pleural cavity; enlarged organs or morbid growths resting upon the cavity of the thorax. b. Very extensive and dense or purgy consolidation of the lungs, with obliteration of the tubes, so that no air can enter, or extensive softening, certain cases of pneumonia, and pneumonia with rapid and abundant exudation. c. Distension of the lungs in emphysema.

These alterations in the intensity of the vocal fremitus may be observed over a very limited region, or over a considerable part of the chest. It is at the base and apex of the lung that they are chiefly important, distinguishing between fluid effusion and pneumonic consolidation at the base, and ailing in forming pleuritic consolidation at the apex. Increase and decrease may be noticed in different parts on the same side, again cases of pleuritic effusion the fremitus is often absent below, but is excess above, on account of the compressed state of the lung.

B. *TUBULAR FREMITUS.*—This is effected in much the same way as vocal fremitus, but is of little importance, except when the voice is very weak.

C. *BRONCHIAL FREMITUS.*—Due to the passage of air through the bronchial tubes containing fluid, bronchial fremitus becomes an important sign of bronchitis or oedema, especially in the case of young children.

D. *PULSATILE PLEURAL FREMITUS.*—Not often met with, this fremitus indicates the presence of much firm material in connection with the

pleura. It is most frequently observed during the later stages of acute pleurisy, but may be very marked in cases of chronic dry pleurisy.

IV. PHYSICAL SIGNS OBTAINED BY PERCUSSION.

A. *Percussion-Sounds.*

SOUNDS IN HEALTH.—Five distinct sounds may be obtained by percussion in a healthy subject, which differ in their degree of resonance, length, fulness, pitch, and clearness.

1. *Tympanitic or Drum-like.*—In this country the term “tympanitic” is applied to the sound which is elicited by percussing over the abdomen, being dependent upon accumulation of gas within the stomach and intestines. It has considerable resonance, is of prolonged duration, low in pitch, full, and may be either more or less muffled or clear, according to the degree of distension.

2. *Pulmonary or Subtympanitic.*—This is the sound brought out by percussing over healthy lungs, and which is therefore present over the greater part of the chest. Possessing a fair amount of resonance, it is shorter, less full, and higher-pitched than the tympanitic sound, and ordinarily is muffled. It has been likened to the sound elicited by striking over a “muffled drum.”

3. *Laryngeal, Tracheal, or Tubular.*—As the names indicate, this sound is produced over the windpipe. Much less resonant than those already described, it is also considerably shorter and of higher pitch, and has a tubular quality; as a rule it is not clear, on account of the structures which cover the air-tube.

4. *Bony or Osteal.*—It is not always possible to get the osteal sound distinctly over the healthy chest, but it imparts its characters to other sounds, especially over the sternum and clavicles. It can be observed over any of the bony prominences of the body. With hardly any resonance, this is a very short, high-pitched, and tolerably clear sound.

5. *Dull or Non-resonant.*—When percussion is made over solid organs and structures, the sound elicited is more or less dull, short, and abrupt; it is supposed that each organ gives rise to a peculiar pitch of its own, but certainly very few are able to appreciate this.

CHANGES AFFECTING THE PERCUSSION-SOUNDS.

When percussing the chest with the view of obtaining evidence of disease in connection with the lungs by the aid of the sounds elicited, the points to be noticed are—1. Whether there is any actual change in the characters of the pulmonary sound elicited over the chest as a whole, or over any part of it. 2. If there is any increase or diminution in the extent over which the normal pulmonary sound is heard. 3. If the

proper difference is noticed between the sounds produced after a full inspiration and after a deep expiration respectively, either generally or locally, both as regards characters and area. 4. If superficial and deep percussion yield different results.

1. CHANGES IN THE CHARACTERS OF THE PULMONARY SOUNDS.—

1. *The percussion-sound may become extra-resonant or actually tympanitic.*—*Causes.* (i.) Pneumothorax or hydro-pneumothorax, provided the amount of air in the pleura is not so great as to stretch the chest-walls very immoderately, when it is found that the sound becomes dull. (ii.) Certain states of the lungs, in which there is excess of air in proportion to the solid tissues, often with more or less distension, viz., emphysema, hypertrophy, atrophy, extreme bloodlessness. In these conditions the sound is too resonant, but rarely actually tympanitic.

2. Without any marked alteration in quality, *the pulmonary percussion-sound may become unusually clear, e. g.,* in some cases of bronchitis, congestion, œdema of the lungs, or the early period of pneumonia. This is due to "liquid or solid being mixed intimately with air-containing tissues," and the sound under these conditions may even assume a tubular quality.

3. *Resonance may be more or less diminished to absolute dulness.* When this deviation from the normal exists, it is necessary to note the degree of the change, which may vary from a slight deficiency in resonance to the most complete dulness; its situation and extent; the pitch of the sound elicited; the form of the dulness; and, in some cases, whether alteration in posture has any effect upon it. There are two dull percussion-sounds which call for special mention: 1. *The hard wooden sound*, which is very short and abrupt, almost non-resonant, exceedingly high-pitched, and accompanied with a sensation of much resistance. 2. *Putty-like*, this being, as its name suggests, an absolutely non-resonant, dull, heavy, and dead sound. *Causes.* It may be useful to enumerate all the causes which are capable of giving rise to abnormal dulness in various parts of the chest. (i.) Certain affections of the chest-walls, such as infiltrated cancer, diseased or inflamed bone and its consequences, periostitis. (ii.) Accumulations in the pleural sac, of serum, pus, or blood; or its extreme distension with air. (iii.) Excessive solid or liquid materials in the bronchi, air-vesicles, or tissues of the lungs, e. g., pneumonia, phthisis, great congestion or œdema, abscess, extensive bronchitis, thickening and dilatation of the bronchi, cancer. (iv.) Considerable collapse or compression of the lungs; or, on the other hand, extreme distension. (v.) Enlargements in connection with the heart, or solid or fluid accumulations in the pericardium. (vi.) Mediastinal enlargements of all kinds, such as various tumors, enlarged glands, abscess, aneurism. (vii.) Enlarged or displaced abdominal organs, especially liver or spleen; or rarely, tumors extending upwards from the abdomen.

Peculiar Sounds.—*a. Tubular.* This sound is not uncommonly met with in some part of the chest, but never over any great extent. It resembles that produced over the trachea, varying somewhat in its pitch, and usually being quite clear. *Causes.* (i.) Cavities in the lungs, not too large, superficial or having some firm, well-conducting tissue between them and the chest-walls, and containing little or no fluid. Such cavities are generally associated with phthisis, but may be due to enlarged bronchi. (ii.) The presence of some solid material between the trachea or one of the main bronchi and the surface, forming a well-conducting medium, *e. g.*, any mediastinal tumor, but especially enlarged glands in the posterior mediastinum, the tubular sound being then heard in the interscapular regions, particularly in children. (iii.) Certain conditions in which the lower part of the chest is invaded upon, so that the lung is pushed or floated upwards, some believing it to be in a relaxed, others in a condensed condition; a tubular sound is then perceptible under the clavicle. This is often observed in cases of pleuritic effusion; occasionally in connection with tumors in the chest or enlarged abdominal organs, and consolidation of the lung itself, *e. g.*, pneumonia.

b. Amphoric. This is a peculiar resonant sound, of a hollow, metallic character, and of very rare occurrence. *Causes.* (i.) A very large phthisical cavity in the lungs, situated near the surface, usually adherent, having smooth, thin, but firm walls, and containing chiefly air, with but little fluid. (ii.) Pneumothorax occasionally.

c. Metallic.—This is a high-pitched sound, of distinctly metallic quality, not unfrequently tinkling or splashing. It is not always easy to distinguish it from the *cracked-pot sound*, and both may be elicited in the same case, according to the force used in percussion, as they depend upon similar physical conditions, *viz.*, a cavity containing air.

d. Cracked-pot or cracked-metal sound, "bruit de pot fêlé." Also of metallic quality, it has further a cracked character, as its name indicates, and gives the impression of air being driven out through a chink or small aperture. It may be imitated somewhat by clasping the hands loosely together, and striking the back of either of them over the knee, so as to drive out the inclosed air. *Causes.* In the chest the cracked-pot sound is caused by air inclosed between two surfaces, the anterior of which is yielding, being suddenly expelled through an orifice, and it may be met with under the following conditions. (i.) It is most important as a sign of a cavity in the lung, of good size, superficial, containing air, having one or more bronchi opening into it, and its front wall being more or less yielding. These conditions are best fulfilled by phthisical cavities at the apices of the lungs, hence the sign is most commonly observed in one or other infraclavicular region. In order to elicit it, the patient should open his mouth and turn towards the operator, and percussion must be made firmly but rapidly and abruptly,

during the act of expiration. (ii.) In children affected with bronchitis, or even when very young infants merely cry, a sound resembling a cracked-pot sound may be brought out in many parts of the chest, but there is no difficulty in distinguishing this from that due to a cavity. (iii.) In rare instances this sign is observed over the front of the chest in cases of pleuritic effusion, or consolidation of the posterior part of a lung.

II. CHANGES IN THE EXTENT OF PULMONARY RESONANCE.—The area of pulmonary resonance may be: *a. Increased*, when the lungs are distended with air, especially in emphysema, but also as the result of hypertrophy or temporary inflation. *b. Diminished*. It is not easy to separate this deviation from ordinary dullness, still it affords an important sign of the lung being contracted within its usual limits.

III. EFFECTS OF INSPIRATION AND EXPIRATION UPON THE PERCUSSION-SOUND.—*a. There may be no extension in area or increase in amount of resonance after a full inspiration, either generally or on one side; and no diminution in the same after a deep expiration. Causes.* (i.) Extreme distension with loss of elasticity of the lungs, as in emphysema. (ii.) Some obstruction to the passage of air through the air-tubes, *e. g.*, bronchitis, spasmodic asthma. (iii.) Interference with the expansion of the lung, either from external pressure, such as that of pleuritic effusion or adhesions; or from extensive disease in itself. This only affects the results of inspiration. (iv.) Air in the pleural cavity, which cannot be increased or diminished in quantity.

b. In cases of suspected consolidation at the apex of a lung, where the signs are not marked, it is very important to notice whether there is a proper difference in the percussion-sounds after a deep inspiration and expiration respectively, as regards amount and area of resonance, and alteration in pitch.

IV. DIFFERENCE BETWEEN SUPERFICIAL AND DEEP PERCUSSION.—This may be of much use in determining the precise physical conditions present in a plethorical lung. Superficial percussion may give rise to hard dullness, showing the presence of much consolidation; but on deep percussion a cracked-pot sound may be elicited, indicating the existence of a cavity within the consolidation.

B. Sense of Resistance or Elasticity.

When percussing, the sensation which is conveyed to the fingers should always be noted. The information thus obtained is mainly useful—*a.* In making out the state of the chest-walls as to rigidity, elasticity, distension by air, etc. *b.* In distinguishing between dullness due to fluid or some solid mass. *c.* In determining the amount and actual density of any solid accumulation.

V. PHYSICAL SIGNS OBTAINED BY AUSCULTATION.

A. *Respiratory Sounds.*

SOUNDS IN HEALTH.—In health three typical sounds may be heard during the act of breathing, on listening over different parts of the respiratory apparatus.

1. *Tracheal or Laryngeal.* Heard on applying the stethoscope immediately over the windpipe in the neck, this sound has the following characters: It is very loud, hollow, and high-pitched; begins simultaneously with the act of inspiration, and continues of the same intensity throughout; there is a marked interval between the inspiratory and expiratory sounds; and the latter is well heard, being rather the longer, louder, and higher pitched. This sound is laryngeal in its origin.

2. *Bronchial.* This differs from the former in the following particulars. It is not hollow, or so loud or high-pitched; has a harsh quality; is not quite so rapidly evolved; does not present such a distinct interval between inspiration and expiration; and the latter is shorter than in the tracheal sound. Bronchial breathing may often be heard normally in the interscapular regions, and over the upper part of the sternum and contiguous end of the clavicle. It is the laryngeal sound modified by conduction along the larger bronchi.

3. *Pulmonary or Vesicular.* On listening over the greater part of the chest, a soft, breezy sound is heard during inspiration, gradually developed but continuous; no interval can be observed between it and the expiratory sound, which, when present, is very much shorter and more feeble, though rather harsher and lower pitched, but not infrequently it is quite inaudible. Some believe that the pulmonary sound is actually originated in the air-vesicles; others that it is either entirely or in part the laryngeal sound conducted and modified.

Several conditions influence the breath-sounds in health, but only *age* and *sex* can be here alluded to. In children they are very loud, and expiration is prolonged, this breathing being termed "puerile." In aged persons the sounds are weak, but expiration is usually lengthened. In females they are usually loud, and often jerky.

CHANGES IN THE BREATH-SOUNDS OVER THE CHEST DUE TO DISEASE.

I. CHANGES IN INTENSITY.—1. *The breath-sounds may be weakened in various degrees, or completely suppressed, either over a limited region, over one side, or over the greater part or whole of the chest. In some conditions they seem to be deep and distant. Causes.* a. Anything interfering with the entrance of air through the air-passages into the lungs, whether due to spasmodic constriction, internal obstruction, or

external pressure. *b.* Imperfect respiratory movements, on account of pain, paralysis or spasm of the muscles, or any other cause. *c.* Permanent distension of the lungs, so that little or no air can enter them, as in emphysema. *d.* Any condition which, by pressing upon the lungs, prevents them from expanding, or interferes with the transmission of sound, *e. g.*, pleuritic accumulations of all kinds, extensive adhesions, abdominal enlargements invading upon the chest, intrathoracic tumors. *e.* Very extensive or very dense consolidation of the lungs, *e. g.*, extensive cancer, certain cases of phthisical or pneumonic consolidation. *f.* Conditions in which the respiratory sounds are obscured by râles, *e. g.*, capillary bronchitis or pulmonary œdema.

2. *The respiratory sounds may be "puerile," being increased in intensity, the expiratory portion becoming then unusually distinct.* *Causes.* *a.* If one lung or any portion of one or both is called upon to do extra work, in consequence of interference with the functions of the other lung or parts, the respiratory sounds become puerile over the corresponding regions. This is observed, for instance, in cases of pleuritic effusion or adhesions, consolidation of parts of the lungs, or obstruction of a bronchus. *b.* When a bronchus is suddenly relieved of spasm, the breathing becomes exaggerated over the portion of lung to which its ramifications pass.

II. CHANGES IN RHYTHM.—Many deviations in rhythm are described, but only two can be readily appreciated, so as to be practically useful.

1. *The breath-sounds may become more or less jerky or wavy, so as sometimes to have a cogged-wheel rhythm, especially the inspiratory sound.* This is by no means a reliable sign of disease, especially in females, in whom it is often met with if they are at all nervous or hysterical, while it frequently depends upon excited cardiac action. It may be observed—*a.* in painful affections of the chest, such as early pleurisy or pleurodynia, when the patient often breathes in a jerky manner; *b.* in the early stage of phthisis; *c.* in connection with old pleuritic adhesions.

2. *The most important change in rhythm is a prolongation of the expiratory sound, so that it may become twice or even three or four times the length of that of inspiration, which often becomes actually shortened.* Prolonged expiration generally attends certain alterations in the breath-sounds to be immediately noticed, but it may be the main or the only alteration observed. *Causes.* *a.* Emphysema, the elasticity of the lungs being more or less diminished. *b.* Obstruction to the exit of air through the respiratory passages.

III. CHANGE IN THE EXTENT OVER WHICH THE BREATH-SOUNDS ARE HEARD.—This may be: 1. *Increased*, from distension of the lung. 2. *Diminished*, owing to retraction.

IV. CHANGES IN QUALITY, ALONG WITH OTHER CHARACTERS.—Some very important abnormal breath-sounds are met with, which differ en-

tirely from those ordinarily heard over the chest, in their quality, pitch, rhythm, and other particulars.

1. *Harsh or Rough Breathing*.—As its name indicates, this merely implies a harshness of the sound, the soft, breezy character being wanting, which is specially marked during expiration, this being unduly lengthened. It is not very reliable as evidence of disease, but is frequently observed in connection with slight consolidations, bronchial catarrh, emphysema, the early period of pneumonia, and various other morbid conditions.

2. *Bronchial*.—In its character this corresponds with the normal sound thus named, but it is heard in unusual regions, or is unusually marked. *Causes*. *a*. All forms of consolidation of the lungs, if moderate in amount and contiguous to the surface, *e. g.*, phthisis, cancer, chronic pneumonia, some cases of acute pneumonia. Even when the lungs inclose small cavities or dilated bronchi, the breathing is often bronchial, provided sufficient solid material intervenes between them and the surface. *b*. Condensation of the lung from pressure.

3. *Blowing*.—Though approaching on the one hand to bronchial breathing, and on the other to tubular, this sound has sufficiently distinctive characters to merit recognition. It differs from the former in its markedly “blowing” quality, being clearer and higher-pitched; from the latter in being diffused, and not hollow or as if originated in a localized tube. *Causes*. *a*. Diffused consolidation, not too abundant, *e. g.*, phthisis, pneumonia. *b*. Small cavities or dilated bronchi surrounded by solid material.

4. *Tubular*.—A high-pitched, concentrated, somewhat hollow and metallic sound, this much resembles the normal tubular breathing heard over the trachea, and gives the impression of being directly conveyed from a tube. *Causes*. *a*. Acute pneumonia, in which disease it is often of the most typical kind. *b*. Certain cavities in the lungs. *c*. A solid mass of moderate size intervening between the trachea or a main bronchus and the chest-wall, so as merely to form a medium of communication between them.

5. *Cavernous*.—This is a clear, distinctly hollow sound, varying in its pitch, which tends to be low, especially during expiration. It is usually only perceived over a limited area, and strikes the ear as being produced in a hollow space, its exact characters varying according to the dimensions and other characters of this space. *Causes*. *a*. A cavity in the lung of some size, tolerably superficial, and not containing much fluid. *b*. In rare instances, it is said, consolidation around an ordinary sized bronchus.

6. *Amphoric*.—A still more hollow sound, and of peculiar metallic quality, amphoric breathing resembles the sound heard on blowing into a large empty glass bottle. *Causes*. For its production it is necessary to have an extensive empty cavity, with firm and smooth

walls, into which air enters more or less freely. These conditions are found in: *a.* Pneumothorax most frequently, air entering the pleura through an opening in the lung. *b.* Phthisical excavation in the lung rarely, having one or more bronchi communicating with it.

The morbid sounds just described may be heard in different parts of the same chest, or may be observed in succession over the same region as the physical conditions change, there being no marked boundary-line between them, but a gradual transition from one to another. For instance, in phthisis the breathing, which is at first bronchial, may become blowing, especially in certain regions, and then in succession tubular, cavernous, or even amphoric, as cavities form and increase in size. The hollow sounds, though usually present during inspiration and expiration, may only be heard during the former act. A deep breath usually causes them to become much louder, and frequently a sharp cough enables them to be heard where they did not exist before, owing to the displacement of some obstructing secretion, or the emptying of a cavity. They may appear to be superficial and strong; or more or less deep and feeble. Care must be taken not to mistake a conducted pharyngeal sound for cavernous respiration.

7. In exceptional instances *peculiar respiratory sounds* are met with. In connection with some cavities they may have a *sucking* or *hissing* character. Sometimes the air appears to be drawn away during inspiration, and puffed back during expiration; this is termed the *souffle* or *veiled puff*.

B. *Râles* or *Rhonchi*.

These terms are applied to certain adventitious sounds originated in the lungs or air-tubes. Before proceeding to their consideration, it is necessary to mention that they may be simulated by sounds accompanying contraction of the muscles of the chest-walls; subcutaneous œdema; hairs on the surface of the thorax; fluid in the mediastinal cellular tissue; or the opening up of healthy lung-tissue during a deep inspiration.

Râles or rhonchi are generally produced by the passage of air during the act of breathing: (i.) Through bronchial tubes narrowed by thickening of the mucous membrane; by various deposits upon its surface, such as thick secretion or exudation; or by spasm of the muscular fibres. (ii.) Through fluids of variable consistence, either contained in normal or enlarged air-tubes or vesicles, or in cavities in the lungs. (iii.) Through substances originally solid, which have commenced to soften. (iv.) Into air-vesicles, either of normal size or enlarged, the walls of which are collapsed or stuck together, thus causing them to open up. In rare instances the action of the heart causes rhonchal sounds, when there is much fluid in contiguous tubes or cavities.

The following points must be noticed with regard to these adven-

titious sounds: 1. Their characters, viz., whether dry or liquid; large or small; peculiar quality, such as musical, crackling, bubbling, gurgling, whistling, etc.; pitch; whether at all hollow or metallic, and the degree to which this character is present. 2. If they are heard both during inspiration or expiration, or only during one of these acts. 3. Their situation and extent. 4. Their amount. 5. Whether they are constant or only heard at intervals; and if they are affected by a full inspiration or cough.

CLASSIFICATION AND SPECIAL CAUSES OF RALES OR RHONCHI.

So many different classifications of râles or rhonchi have been invented, and such confusion has prevailed with regard to the meaning of the various terms employed, that it is by no means easy to fix upon any classification. I have, however, adopted the following:

I. VIBRATORY OR DRY MUSICAL RHONCHI.—These sounds are produced by air traversing air-tubes narrowed in some of the ways mentioned above. They vary in their precise characters according to the size of the tube affected and the immediate cause of the narrowing. They are grouped as follows: 1. *Sonorous*. This is a deep-toned, low-pitched sound, varying much in its exact quality, which may be snoring, growling, humming, cooing, etc. It appears superficial, is often extensively heard, and generally accompanies both inspiration and expiration, but may be limited to either act, especially the latter. 2. *Sibilant*. This is of much higher pitch, often whistling, hissing, or musical; not so extensively heard, and, as a rule, accompanies both inspiration and expiration. Both these classes of rhonchi are liable to much irregularity, disappearing from time to time, especially after a cough, and they often occur together. *Causes*. *a*. Bronchitis, especially chronic, but also the acute form in its early stage, and the plastic variety. *b*. Spasmodic contraction of the bronchial tubes in cases of asthma.

II. CREPITANT RHONCHI.—1. *True crepitant rhonchus*. This is a sound only met with in the early stage of acute pneumonia, and is therefore observed usually towards the base of the lung, but may be heard in any part where the inflammatory process is commencing. It consists of a great number of extremely minute, sharp, crepitant, or crackling sounds; equal in size; perfectly dry; heard in short puffs during inspiration, alone in most cases, and often only towards its termination; increased in amount by a deep breath. It has been aptly compared to the sound produced by rubbing a lock of hair firmly between the finger and thumb close to the ear; or to the burning of salt in the fire. The theories as to the production of the *true crepitant râle* are, that it is due to the opening up of air-vesicles stuck together, which is the most probable; to air passing through thick secretion; or

to minute lacerations of lung-tissue. 2. *Redux crepitant râle*. Heard in the advanced stage of acute pneumonia, when resolution is taking place, this differs from the former in the crepiti being much less abundant, larger, and of unequal size, less dry, and perceived during both inspiration and expiration. It gives the impression of air passing through a thick material, which is the pneumonic exudation undergoing softening. A sound of similar characters is sometimes noticed in phthisis. 3. *A large, dry, crepitant râle* is said to be observed in some cases of emphysema, not abundant, and resembling the sound produced by inflating a bladder. It is supposed to be due to the opening up of enlarged vesicles. 4. *Compression or collapse rhonchus*. When the lung is compressed or collapsed from any cause, a râle consisting of a number of small dry crepitations may be slowly evolved at the close of or immediately after a deep inspiration.

III. CRACKLING OR CLICKING RHONCHI.—During the process of softening which the consolidation of phthisis undergoes, certain râles of a crackling character are developed, such as would be expected from the passage of air through such a material. These are named: 1. *Dry crackling or dry crepitation*, which consists of some three or four crackles or clicks, sharp, abrupt, and dry, only heard usually during inspiration. It indicates the commencement of softening. 2. *Moist or humid crackling or crepitation*. Crackling in character, this is more abundant than the dry rhonchus, though the crackles are not large or numerous, but they are more moist, as if air were passing through a less consistent substance, and occur both during inspiration and expiration, being most marked usually in the former. It accompanies a more advanced condition of softening. These râles are chiefly met with at the apices of the lungs.

IV. MUCOUS, SUBMUCOUS, AND SUBCREPITANT RÂLES.—These constitute a very common class of rhonchal sounds, the characters of which are easily appreciated. They result from the transmission of air through fluid contained in the air-tubes; and the varieties observed depend upon the nature and quantity of the fluid, and the size of the tubes in which it exists. Generally they consist of a number of distinct "bubbles," but may have a "crackling," "rattling," or somewhat "gurgling" character. The bubbles vary in size considerably, as well as in number and pitch. If they are of large or medium size, the rhonchus is called *mucous*; if small, *submucous*; and if very minute, *subcrepitant*, because it then somewhat resembles a crepitant sound. It accompanies both inspiration and expiration, being generally more marked with the former, and it may be so abundant as completely to obscure the breath-sounds. A cough often influences these râles greatly, both as to their amount and site, sometimes removing them completely. They are most common and most marked at the bases of the lungs, but may be heard universally over the chest. In children,

and when they originate in the larger tubes, they are apt to have a somewhat metallic character. *Causes.* (i.) Bronchitis. (ii.) (Edema of the lungs. (iii.) Hæmorrhage into the bronchial tubes. (iv.) Rarely fluid from outside the lung emptying itself through the bronchi, such as pleuritic effusion.

V. HOLLOW RHONCHI.—The essential character of these abnormal sounds is that they are all more or less hollow in quality, and convey the impression of being originated in a cavity. For their production a cavity must exist, containing fluid, through which air passes; and the size and other conditions of the cavity will influence their degree of hollowness and pitch, while the amount and consistence of the fluid will affect the actual quality and abundance of the rhonchus. Hence it may be “bubbling,” “crackling,” or “gurgling,” very variable in size and amount, and much subject to change. According to their degree of hollowness and pitch these râles have been subdivided into such varieties as “cavernulous,” “cavernous,” “amphoric,” “ringing,” “metallic,” etc. They are heard generally with inspiration and expiration, but may be limited to either. A cough often makes them disappear or become more distinct. Ordinary mucous râles occasionally assume a hollow character, if produced near a large cavity. The heart’s action sometimes causes cavernous râles by agitating the fluid in a contiguous cavity. Phthisis is the disease in which these râles are chiefly observed.

C. Friction or Attrition Sounds.

By the rubbing together of the adjacent surfaces of either pleura, when this is the seat of certain morbid changes, adventitious sounds are elicited during the act of breathing, usually termed *friction-sounds*. In examining for these it is essential to investigate every part of the chest, but especially its lower portion laterally and behind, as they may be present over but a very small area; and also to make the patient breathe deeply, otherwise the requisite rubbing together of the surfaces may not be brought about.

1. Characters.—As a rule friction-sounds are more or less *rubbing* in quality, varying from a slight *graze* to a loud *grating* sound. They may be *creaking*, *crackling*, *clicking*, or *rumbling*. In not a few cases they much resemble crackling, or even small mucous râles, but are distinguished from these by being unaffected by a cough. *Superficialness* is a prominent character of all these sounds. **2. Site and Extent.**—The lower part of the chest is generally the seat of friction-sounds, especially about the angle of the scapula, and towards the infra-axillary region. They are generally limited in extent, sometimes not covering an area of more than an inch, but friction may be heard all over one or even both sides. **3. Intensity.**—This varies from a scarcely perceptible rub to a sound audible at a distance from the chest. Generally it

is moderately loud. 4. *Rhythm*.—Friction is usually most perceptible during inspiration, but often accompanies expiration also; it may only be heard at the end of a deep inspiration. It is frequently irregular and jerky. 5. *Causes*.—The pathological conditions in connection with the pleura which give rise to friction-sounds are: *a*. Increased vascularity, with prominence of the vessels, which may cause a slight grazing. *b*. Deposit of exudation and proliferation of cellular tissue associated with pleurisy, the characters of the sound depending upon the thickness and density of the material formed, and the amount of fluid mixed with it. *c*. Tubercular and cancerous deposits rarely. It may be mentioned that a cirrhotic liver may cause a sound simulating friction.

D. Vocal and Cry Resonance.

The chief points to notice with regard to the *vocal resonance* are: 1. Its intensity and degree of clearness. 2. Its quality and pitch. 3. The area over which it can be heard. The following are the deviations from the normal state which are met with:

1. *The resonance may be more or less weakened to complete extinction over variable extent of surface*.—*Causes*. (i.) Air or fluid in the pleura, separating the lung from the chest-wall. (ii.) Very extensive or dense consolidation of the lung, such as cancer or some cases of phthisis. (iii.) Emphysema in many cases. (iv.) Intrathoracic tumors, or enlarged abdominal organs encroaching upon the chest. (v.) Obstruction of the bronchi.

2. *It may be increased in intensity or clearness, this being often associated with alterations in quality and pitch*. Four varieties are recognized of this abnormal condition.

(i.) *Bronchophony*.—This term merely implies an increase in the clearness of the vocal resonance, which, however, is generally intensified as well. It is noticed in health in the interscapular regions, especially at the upper part, as well as frequently below the inner end of the clavicles. *Causes*. *a*. Any lung-consolidation, provided it is not excessive, *e. g.*, phthisis or pneumonia; in the latter the bronchophony has peculiar characters, being *metallic* and *sniffing*. *b*. Small cavities in the lung, with thickening and consolidation around. *c*. Condensation of the lung by pressure. *d*. Occasionally a solid mass intervening between a bronchus and the chest-wall, provided it is not too large.

(ii.) *Pectoriloquy*.—Here the voice seems to be conducted directly to the ear along the stethoscope, and the words uttered may often be distinctly understood. It is not uncommonly very intense, and causes a most pleasant sensation to the listener. *Causes*. *a*. Certain cavities in the lungs in the great majority of cases. The conditions required are that the cavity is of good size, but not too large; tolerably smooth, not containing much fluid; with firm, but not too thick walls; being

near or adherent to the chest-walls; and having one or more bronchi communicating with it, so that air may enter. *b.* Very rarely a solid mass between a large bronchus and the chest-wall. *c.* Occasionally pneumothorax.

A variety of pectoriloquy is described under the term *whispering pectoriloquy*, in which a whisper is clearly heard, and often the separate words can be distinguished. This, however, is not an alteration in the voice, but merely a modified expiratory sound. It is only present in connection with large and superficial cavities, and is best heard in pneumothorax, but is not unfrequently noticed in connection with phthisical cavities.

(iii.) *Egophony*.—The vocal resonance has a peculiar *bleating or nasal* quality in some cases of pleuritic effusion, to which the above term has been applied. As a rule it is best heard about the angle of the scapula, but may vary with a change in the position of the patient. Some authorities think that it is due to the presence of a thin layer of fluid between the lung and the chest-wall; others, that it is caused by flattening of some of the bronchial tubes, from superficial collapse of the lung in consequence of pressure.

(iv.) *Amphoric Resonance*.—In certain large cavities, with firm walls, the voice may have the characteristic hollow, metallic character, known as *amphoric*. This is only very rarely noticed in connection with large phthisical cavities or pneumothorax.

3. The area over which *vocal resonance* can be heard will be influenced by the same conditions as those which affect that of the *vocal fremitus*.

E. *Tussive Resonance*.

The cough may be intensified in connection with consolidations and cavities, and may assume peculiar characters, hence named “bronchial,” “cavernous,” “metallic,” “amphoric,” etc., but these alterations do not add much to the knowledge gained by observing the vocal resonance. The uses of cough in the investigation of disease which can be best turned to practical account are these: 1. During the act various rhonchi may be elicited, which are not heard during the mere act of breathing, especially in connection with cavities. 2. Various fluid substances, which have accumulated in bronchial tubes or cavities, may be dispersed and expelled, râles being thus done away with and the breath-sound made louder, so that its characters may be better observed. Thus cough may be the means of distinguishing between friction-sounds and those produced within the lung; and, in connection with cavities, cavernous or some other breath-sound may be heard after a cough, where previously respiration has been quite inaudible.

F. Peculiar Sounds Heard in Connection with Large Cavities.

1. *Metallic tinkling.* Resembling the sound produced by striking a glass vessel with a pin, this is a single, clear, high-pitched, ringing sound, heard in connection with large air-containing spaces, in which there is a little fluid. It is supposed to be produced by the bursting of a bubble, or dropping of fluid from the top of the cavity, and may be originated during the act of breathing, speaking, or coughing; or, rarely, by the action of the heart. Phthisis and hydro-pneumothorax are the diseases in which it occurs.

2. *Amphoric echo.* An echo of amphoric character may attend the respiratory sounds, voice, cough, rhonchi, the heart sounds, or even the act of swallowing. There must be a large cavity, smooth, and containing air, such as is met with in pneumothorax, and occasionally in phthisis.

3. *Bell-sound.* In some cases of pneumothorax, when a coin is placed on the chest and struck with another, a clear sound, like that elicited by striking a bell, may be heard on listening over another part of the chest.

VI. SUCCUSSIO.

This is a mode of examination very seldom required, and merely shows the presence of air and fluid in a large cavity. The signs produced by shaking a patient are: 1. A splashing sensation felt by the hand. 2. A splashing sound. They are occasionally present in hydro-pneumothorax; and extremely rarely in connection with large phthisical cavities.

CHAPTER V.

In the present chapter the more important symptoms associated with the respiratory organs will be briefly considered.

I. DYSPNŒA—APNŒA.

Dyspnœa or *difficulty of breathing* is a symptom requiring careful investigation, as it may be made up of several elements which it is important to distinguish, as well as to localize the cause of the disturbance, which is not necessarily situated in the respiratory organs.

ETIOLOGY.—The conditions which give rise to dyspnœa may be thus arranged: 1. Some impediment to the entrance of air through the air-passages, owing to internal obstruction, spasmodic or other stricture, or external pressure. This may exist in any part of the respiratory

passages, from the mouth to the bronchi. 2. Mechanical interference with the expansion of the chest-walls, from pressure or rigidity; or with the movements of the diaphragm. 3. Loss of the muscular inspiratory force, owing to paralysis or spasm. 4. Deficient expiratory force, as the result of loss of elasticity of the lungs, or rigidity of the chest-walls. 5. Diminution in the working portion of the lungs, from actual destruction, consolidation, liquid accumulation in the air-cells and minute bronchi, collapse, compression, or obliteration of its minute vessels. 6. Affections of the chest or abdomen which render the movements of respiration painful. 7. Improper conditions of the air inspired, such as its being too rarefied, or containing irrespirable gases. 8. Excessive or deficient supply of blood to the lungs, due to some organic or functional derangement of the heart, obstruction in the pulmonary vessels, actual loss of blood or violent exercise. 9. Altered quality of the blood, associated with anæmia, imperfect aeration, or the presence of poisonous elements, in fevers, renal diseases, pyæmia, diabetes, and other conditions. 10. Nervous disturbance in connection with hysteria, strong emotion, cerebral disease, brain poisoning, pressure on the vagus nerves or some of their branches, or reflex disturbance.

CHARACTERS OF DYSPNŒA.—In studying any case in which there is apparent dyspnœa, it is requisite to observe the following points: 1. Whether any subjective sensation of want of air is experienced, as well as its degree, which may amount to a feeling of impending suffocation. 2. The rapidity of the breathing. 3. Whether respiration is increased in depth and force. 4. If the relative lengths of inspiration, expiration, and the interval are disturbed. 5. If there are objective signs of great want of breath, indicated by the posture of the patient; by the extraordinary muscles being brought into play; by working of the *alæ nasi*; or by inability to hold the breath or speak. 6. Whether any noise accompanies the act of breathing, *e. g.*, stridor or rattling. 7. If air enters freely into the lungs or not. Deficient entrance of air is indicated by more or less sinking in of the lower part of the chest, epigastrium, and supersternal fossa during inspiration. 8. If there are any signs of imperfect blood-aeration, with their degree. 9. Whether the dyspnœa is constant, paroxysmal, or subject to exacerbations; and if paroxysms are traceable to any evident cause, such as effort, emotion, taking food, or inhalation of cold air.

SIGNS OF APNŒA.—The phenomena which accompany interference with the respiratory functions are due partly to overloading of the venous portion of the circulatory system, and deficient supply of blood to the arterial portion; but chiefly to the blood being imperfectly aerated, and therefore overcharged with carbonic acid, which acts as a poison, especially upon the brain and spinal cord. At first efforts are made to breathe, more or less violent according to the cause of the dyspnœa, but these diminish and finally cease as the central nervous system becomes

poisoned. The face is turgid, at first flushed, but soon purple or livid, or under some conditions it is deadly pale or mottled, with lividity about the lips, nose, and eyes. Other parts are also blue or livid, especially the nails and other distant parts. Distension of the veins is observed, and the eyes tend to be prominent, suffused, and watery. The temperature becomes reduced, while cold clammy sweats break out. Nervous symptoms soon set in, viz., at first vertigo, disturbance of the senses, mental wandering, twitchings and tremors; followed by drowsiness and stupor, ending in complete coma, convulsions and then relaxation of the muscles, including the sphincters. The pulse is feeble, frequent, and small, but it continues to beat after respiration has stopped, and the heart may be still acting when the pulse has ceased to be perceptible; finally this organ also fails if the termination is fatal.

Post-mortem examination reveals distension of the right side of the heart and of the veins with dark blood; with intense venous congestion and its consequences affecting all the organs and tissues.

TREATMENT.—The main indications are: 1. To remove the cause of dyspnœa, if possible. 2. To attend to the posture of the patient, adopting that in which breathing is most easily performed. 3. To avoid all kinds of effort, as well as other causes which are liable to bring on attacks of dyspnœa. 4. To assist the patient by mechanical means, when these are available to make up for impaired respiratory forces. 5. To see that the supply of air is sufficient, as well as that this is pure and otherwise suitable to the conditions of the patient. 6. To administer, either internally or by means of inhalation or subcutaneous injection, remedies which tend to relieve dyspnœa, especially depressants, antispasmodics, or stimulants. 7. To employ local measures, such as the application of sinapisms, fomentations of different kinds or turpentine stupes, free dry-cupping over the chest, etc. 8. To treat apnœa. For this purpose the most reliable means are sinapisms over the chest and other parts; a warm bath, with free cold affusion over the head and shoulders while in it; slapping the chest with a wet towel; artificial respiration; galvanism along the vagus nerves; and, when necessary, the performance of laryngotomy or tracheotomy.

II. COUGH.

ETIOLOGY.—The causes of cough may be summed up under the following heads: 1. An irritable condition of the mucous membrane in some part of the air-passages, but especially in the throat and larynx. This is particularly observed in connection with inflammatory affections, the sensibility being then much exalted. 2. Some source of direct irritation or annoyance in the throat, larynx, trachea, or bronchi. This may be due to morbid conditions of normal structures, such as the uvula, tonsils, epiglottis, or vocal cords; the presence of irritating par-

ticles, or larger foreign bodies introduced during inspiration; certain conditions of the air inhaled, such as a very low temperature, or impregnation with irritating gases; or the collection of secretion or morbid products, *e. g.*, serum, mucus, pus, blood, croupous or diphtheritic deposit. At the same time there is frequently increased irritability of the mucous surface. Cough from this cause may be voluntarily excited, but it is often involuntary and irrepressible, especially when the irritation is in the neighborhood of the glottis. 3. Reflex cough. In many cases cough depends upon reflex irritation, but before deciding that such is its origin, it is always well to look carefully for some more immediate cause. The source of irritation may be in the lungs or pleuræ; heart or pericardium; alimentary canal (*e. g.*, dyspepsia, dentition, worms); liver; peritoneum; ear; female generative organs; or external surface. 4. An unhealthy condition of the blood. This is supposed to give rise to cough by its effect on the nervous system, *e. g.*, the state of the blood associated with gout or rheumatism. Most commonly, however, some local cause can be detected in these cases. 5. Nervous disturbance in connection with hysteria, brain-disease, or irritation of the respiratory nerves.

CHARACTERS OF COUGH.—This symptom requires investigation with respect to the following particulars: 1. The frequency of its occurrence, and whether it is constant or paroxysmal. 2. The severity and duration of the fits. 3. The mode of onset, whether the cough is a voluntary act, or involuntary and irrepressible, preceded by a sense of irritation in any part; or if it is brought on by some obvious cause, such as exertion, change of posture, inhalation of cold air. 4. Its characters, and the sounds which are produced during the act, both in inspiration and expiration. The chief varieties are hacking, hoarse, wheezing, barking, ringing, metallic, croupy, hooping, crepitous, and aphonic. 5. Whether it is dry or attended with expectoration. In the latter case it is necessary to ascertain whether expectoration is effected easily or with difficulty; and also to make a personal examination of the sputa, observing: *a.* Their quantity. *b.* General characters as to color; odor; whether in one mass or in separate lumps, with the size and shape of the latter; transparency or opacity; amount of frothiness; consistence and degree of adhesiveness. *c.* If any special substances are evident to the naked eye, such as blood, fibrinous casts, or calcareous particles. *d.* Microscopic characters. *e.* Chemical composition in some cases. 6. If the cough terminates in vomiting, or is followed by relief of any previous unpleasant symptoms.

TREATMENT.—It is not always desirable to check cough, provided it is not excessive, and that it serves some useful purpose in the way of getting rid of materials accumulating in the lungs; indeed in some instances it has rather to be encouraged. In order to put a stop to or relieve cough the chief indications are: 1. To instruct the patient

voluntarily to suppress the act as much as possible. 2. To remove the cause of cough if practicable, and avoid everything which is likely to excite it. 3. To administer sedatives and other remedies, which will be pointed out under the several diseases. 4. To employ anodyne inhalations, which are very valuable in some cases. 5. To apply local remedies to the throat or larynx, when these parts are in a morbid condition. 6. To limit or check the formation of secretion in the lungs or air-tubes, and thus prevent the necessity for the act of coughing; or to alter its characters, so that it may be more easily discharged. When a patient is obliged to cough, the act may often be assisted by mechanical means, such as applying a bandage around the lower part of the chest.

III. HÆMOPTYSIS.

Hæmoptysis or "spitting of blood" signifies the discharge of blood through the mouth from any part of the respiratory organs below the upper opening of the larynx. It may come on without any warning, or be preceded by premonitory symptoms, such as weight or fulness about the chest, dyspnœa, a sense of heat, tickling in the throat, or a saltish taste. Usually the blood is brought up by coughing, but it may rise in gulps without any effort, or sometimes comes in a sudden gush, when it may even escape through the nose as well. Not unfrequently vomiting is excited. The quantity varies from a few streaks in the sputa to an amount sufficient to cause instant death. The blood is generally bright and florid, and more or less frothy; but occasionally it is dark and nonaerated, especially when abundant and suddenly discharged. Clots may be observed, but the greater portion is usually liquid. There is no change in the blood as a rule, either as regards its general or microscopic characters. The duration of an attack of hæmoptysis varies much, but after the more urgent symptoms have subsided, the sputa are generally tinged for some time. Recurrence is a frequent event, and in some cases spitting of blood occurs periodically.

If the blood comes from either lung in any quantity *moist râles* are generally heard over the corresponding part of the chest.

The effects on the general system will depend on the amount of blood lost, and the rapidity and duration of its discharge. Death does not often result immediately from hæmoptysis, but may happen either from the direct loss of blood, or from its causing suffocation. Frequently some febrile excitement is associated with hæmoptysis, the pulse being full and bounding, but soft. Should any blood remain in the lungs, it is liable to set up inflammation, and there is strong reason to believe that in this way phthisis may be originated.

ETIOLOGY.—The sources of the blood in hæmoptysis, and the morbid conditions giving rise to this symptom, may be thus classified: 1. In some instances there is no obvious local disease. In this group may

be included hæmoptysis from going up a height, severe straining or coughing, or blowing wind instruments, which is especially apt to occur in those who are delicate and whose tissues are weak; vicarious hæmoptysis; that due to the inhalation of irritating substances or to injury; and that dependent upon an unhealthy state of the blood, *e. g.*, scurvy or purpura. 2. Diseases of the larynx, trachea, or bronchi, *e. g.*, congestion, inflammation, ulceration, morbid growths, especially cancer. 3. Diseases of the lungs, viz., phthisis, cancer, congestion, acute or chronic pneumonia, abscess, gangrene, hydatids. 4. Mediastinal tumors opening into the air-passages, including also tubercular and cancerous glands. 5. Cardiac diseases, viz., mitral disease, hypertrophy of the right ventricle, or a weak dilated left ventricle. 6. Disease of the pulmonary vessels. 7. Aneurism opening into the air-passages. It must be remembered that blood sometimes enters the windpipe from the throat or nose, and is then expectorated.

The blood in hæmoptysis generally comes from the capillaries, but not unfrequently a considerable branch of the pulmonary artery either gives way or is perforated by erosion. In phthisis minute aneurisms have been found upon the branches of this vessel, which have ruptured and thus caused large hæmorrhages.

There may be no immediate *exciting cause* of hæmoptysis; or it is brought on by exertion, coughing, or some other disturbance.

DIAGNOSIS.—Hæmoptysis may be simulated by bleeding from the mouth or throat; or by epistaxis. The quantity and characters of the blood discharged; the mode of ejection; and, above all, thorough examination of the nose, mouth, and fauces, as well as of the chest, will generally indicate the source of the bleeding. The part of the respiratory apparatus from which the blood escapes is also usually ascertained by physical examination, and by the local symptoms present. Erosion of a large branch of the pulmonary artery is characterized by the coughing up of a quantity of dark blood. The diagnosis between hæmoptysis and hæmatemesis will be pointed out after the latter symptom has been considered.

TREATMENT.—Hæmoptysis must be treated on the principles applicable to hæmorrhages in general, but its management will necessarily vary according to its cause. Ordinarily, when the blood escapes from the lungs the chief things to be attended to are to keep the patient entirely at rest in a cool room, in the recumbent posture with the head rather high; to subdue cough as much as possible; to give ice to suck freely; and to administer astringents with vascular sedatives. Gallic acid in full doses with opium every two or three hours; acetate of lead and opium; dilute sulphuric acid with alum; turpentine; and ergot of rye, are the most useful remedies. At the Brompton Hospital the gallic acid and opium mixture is found very efficacious. The subcutaneous injection of ergotin has of late years come into much repute. Digitalis

is most valuable if the heart is acting excitedly. Saline aperients are useful in plethoric patients. Some practitioners have recourse to venesection or local abstraction of blood, but this is rarely a desirable plan of treatment. The application of ice to the chest is often exceedingly beneficial, but it must be done carefully, the ice being removed by degrees. Dry cupping over the chest is serviceable in some cases. It is sometimes useful, when a case does not yield to ordinary treatment, to draw the blood towards the limbs by means of hot foot-baths or a Junod's boot; or to apply ligatures around them. In hæmorrhage vicarious of menstruation or due to stoppage of bleeding from piles, the application of leeches to the lower extremities or around the anus is said to do good. In all cases of hæmoptysis of any moment, it is important to keep the patient under observation until any irritation due to the presence of the blood in the lungs has entirely subsided. If there is any tendency to spitting of blood, everything likely to bring on an attack must be avoided, while the condition of the blood is improved by proper dieting and the administration of tincture of steel.

CHAPTER VI.

DISEASES OF THE LARYNX AND TRACHEA.

I. ACUTE INFLAMMATION—ACUTE LARYNGITIS AND TRACHEITIS.

ETIOLOGY.—*Predisposing causes.* Acute inflammation of the larynx and trachea assumes different forms and degrees of intensity, but they are all predisposed to by certain conditions, viz., a lax, weakly, and ill-nourished condition of the system; effeminate habits; immoderate wrapping up of the neck; previous attacks, especially if repeated; and a climate or season characterized by a cold moist atmosphere, cold winds or rapid changes of temperature, the complaint being, therefore, more prevalent during winter and spring. Males suffer more than females. As regards age, laryngeal catarrh is most common among adults, but the croupous variety is essentially a disease of childhood, especially from the first to the seventh year, it being rarely met with after ten years of age. Unfavorable sanitary conditions predispose to croup, and the children of the poorer classes chiefly suffer.

Exciting causes. The causes of acute laryngitis may be enumerated as follows: 1. Direct irritation, from breathing very cold or hot air, steam, acrid vapors, or air containing irritating particles; or from swallowing boiling or corrosive liquids. 2. Excessive coughing, or

violent exercise of the voice in speaking, shouting, and singing. 3. Morbid conditions in the larynx, *e.g.*, ulcers or growths; or operations for the removal of the latter. 4. Direct exposure of the front of the neck to a cold draught. 5. General exposure to cold, the larynx being involved either alone or along with other mucous surfaces. 6. Extension from the nose or pharynx, or occasionally from the bronchi. 7. Certain febrile conditions, of which it forms a complication, especially influenza, erysipelas, measles, and typhus fever. 8. Secondary syphilis.

The etiology of certain special forms of laryngitis demands separate notice. *Edematous laryngitis* generally follows some previous laryngeal disease, but may be due to mere cold; it is also particularly liable to arise from swallowing boiling liquids. This usually happens among the children of the poor, who are fond of attempting to drink out of the spout of the tea-kettle. Laryngeal inflammation complicating erysipelas is prone to be attended with œdema. *Croupous inflammation* has recently been the subject of much discussion. French writers have always regarded this variety as identical with *laryngeal diphtheria*, and therefore as always resulting from contagion or bad hygienic conditions. Dr. George Johnson has come forward in support of this view, towards which Sir W. Jenner is also inclined. The general belief, however, is that there is a distinct form of croupous laryngitis, having no connection with diphtheria, but due to exposure to cold, especially to northerly or northeasterly winds, or to a general chill. Occasionally it sets in as a secondary complaint, in the course of some of the exanthemata, *viz.*, small-pox, measles, scarlatina, typhus or typhoid fever, or erysipelas.

ANATOMICAL CHARACTERS.—The morbid appearances will differ according to the nature and results of the inflammation. In catarrhal laryngitis more or less bright redness is usually observed, with swelling, opacity, and slight softening of the membrane. Spots of epithelial erosion are common, but actual ulceration is very rare. After a time secretion forms, sometimes very viscid, containing an abundance of young cells. *Edematous laryngitis* is characterized by the accumulation of serum in the submucous tissue, especially in those parts where this is very lax, which gives rise to much translucent swelling, with a sodden, flabby condition of the structures, but the redness is less marked. Very rarely sero-purulent or purulent fluid infiltrates the tissues. In low fevers gangrene may occur.

The special character of croupous or plastic laryngitis is that the surface of the mucous membrane becomes covered to a variable extent with a croupous exudation or deposit, or so-called "false membrane," the epithelium being destroyed. This may be limited to a small portion of the surface or to separate patches, or it may cover the whole of the larynx and trachea, occasionally extending even into the smaller

bronchi. Its main seat is said to be the trachea. In thickness it may range from a mere film to two or three lines or more. The consistence varies, but it is generally tolerably tough, compact, and adherent for a time, finally becoming detached. Its under surface frequently presents little points of extravasation. A fresh deposit not uncommonly forms after the membrane is separated, and this may be repeated several times. Under the microscope it is seen to consist of an amorphous or finely fibrillated substance, in which abundant young cells are involved. There is very little swelling of the mucous membrane as a rule; and its structure is not at all affected.

When death results from acute laryngitis, especially croup, some of the following morbid conditions are generally found, viz., bronchitis; congestion and œdema of the lungs; lobular or lobar pneumonia; localized emphysema and collapse; distension of the heart and venous system with dark blood; congestion of organs; and slight serous effusions. The lymphatic glands beneath the thyroid body on each side of the trachea may be enlarged.

SYMPTOMS.—The clinical history of acute inflammation of the main air-tube differs in the several varieties, and therefore each calls for separate consideration.

I. ACUTE CATARRHAL LARYNGITIS AND TRACHEITIS. LARYNGEAL AND TRACHEAL CATARRH. CYNANCHE LARYNGEA.—This variety assumes very different degrees of severity, but the following are the usual symptoms: Unpleasant sensations are experienced over the windpipe, such as dryness, roughness, constriction, soreness, burning, or tickling, which are increased by coughing or speaking. These are chiefly felt when the upper part of the larynx is involved. Swallowing is often rather painful. The voice is husky and frequently hoarse or cracked, or may become quite lost. Cough is commonly a prominent symptom, there being a constant tendency to paroxysmal attacks. It is harsh and hoarse, or may become completely aphonic. The patient is also often disposed to hawk repeatedly. At first there is no expectoration, but after awhile a little clear viscid mucus containing young cells may be expelled with difficulty, this finally becoming more abundant and muco-purulent. Respiration is not much interfered with in ordinary cases.

Laryngeal catarrh occurring in young children is liable to be attended with far more serious symptoms, owing to the small size of the air-tube; to the edges of the glottis being glued together by viscid secretion; and to the tendency to spasm. There can be no doubt but that this is the condition present in a large proportion of cases of so-called "croup," constituting what has been termed "stridulous laryngitis" or "false croup." Breathing is much obstructed and stridulous, and all the croupy symptoms to be presently described may be present.

In some cases of catarrhal laryngitis there are no general symptoms,

but usually more or less pyrexia is observed. In children there may be the ordinary signs of blood-poisoning from apnoea.

2. **ŒDEMATOUS LARYNGITIS.**—Œdema may supervene very rapidly, and in the course of an apparently slight attack of laryngeal catarrh. It is a highly dangerous condition, and if not relieved may cause speedy suffocation. The characteristic features of œdematous laryngitis are a sensation of the presence of a foreign body; more marked dysphagia; with urgent dyspnoea of laryngeal characters, inspiration being whistling or hissing, but expiration being comparatively or quite easy. Voice is completely lost, and cough becomes aphonic. It is usually believed that spasm of the glottis aids in the causation of dyspnoea, but some are of opinion that the muscles are paralyzed.

The general symptoms are indicative of more or less grave interference with the respiratory functions, and consequent deficient blood aeration.

3. **CROUPOUS OR PLASTIC LARYNGITIS. MEMBRANOUS CROUP. TRUE CROUP. CYNANCHE TRACHEALIS.**—An attack of *idiopathic* or *primary* croup is frequently preceded by some premonitory symptoms for a day or two, such as slight harsh cough and hoarseness, sore throat, with some pyrexia and constitutional disturbance. In some cases, however, the disease comes on suddenly, and without any previous warning. The attack usually sets in during the night, while the child is asleep, and when established the symptoms are very characteristic.

Local. The voice is at first harsh and hoarse, or at times cracked and shrill, finally becoming whispering or completely lost. Paroxysms of spasmodic "croupy" cough come on, short, sharp, and abrupt in character, dry, of high pitch, and somewhat metallic, clanging, or brassy quality. The cough is interrupted by a shrill, ringing, whistling, or "crowing" inspiration. Soon it becomes husky and muffled, and at last loses all sound. Respiration is greatly impeded, and presents some peculiar characters. The act is exceedingly labored and attended with violent efforts; it is also prolonged, and therefore not frequent; inspiration is accompanied with a high-pitched, metallic, sibilant, or wheezing stridor, which may be heard at some distance off.

These symptoms are not persistent, but there are intervals of complete or comparative ease, especially during the day. In severe cases, however, or in the advanced stage of those tending towards a fatal issue, there may be scarcely any remissions. The paroxysms of dyspnoea are commonly believed to be partly caused by spasm of the muscles, but Niemeyer argued that these are paralyzed.

The child often grasps its throat or puts its hand to its mouth, as if to remove some obstruction, and if old enough may complain of local pain. A little thick viscid mucus is sometimes brought up by coughing, and in some cases flakes or larger patches or even a cast of exudation,

which may be followed by temporary or permanent relief. Deglutition is sometimes difficult.

General. At first the general symptoms are febrile, and the temperature may rise to 102° — 103° or more, the pulse being frequent, full, and hard. Subsequently, however, the pyrexia abates, and in severe cases the prominent signs are those associated with imperfect aeration of blood, which are intensified during the paroxysms. Ultimately in fatal cases gradual or rapid suffocation ensues, attended with the phenomena of apnœa. Pulmonary complications frequently arise and increase the danger.

Secondary croup may set in during the course of the diseases already mentioned, giving rise to more or less severe symptoms resembling those met with in primary croup.

PHYSICAL EXAMINATION.—Examination of the throat by sight and touch may reveal the condition of the epiglottis, should it be red and swollen; and also the presence of œdema. Auscultation over the wind-pipe may detect changes in the laryngeal breath-sound, or local mucous râles; or sometimes in croup a peculiar rhonchus named “*tremblotement*,” which is heard during inspiration and expiration, and supposed to be due to the flapping of a piece of false membrane; probably this sound can be produced by thick mucus. The laryngoscope is often inapplicable, especially if the epiglottis is much affected, and in cases of croup; when it can be employed, it might reveal bright redness, turgidity, swelling, œdema, or alteration in shape of various parts; or the presence of thick secretion or croupous deposit. Examination of the chest indicates more or less interference with the entrance of air into the lungs in cases of œdematous or croupous laryngitis, especially when children are affected. The pulmonary sound may be obscured by a loud laryngeal sound, and mucous râles are sometimes heard over the chest. Pulmonary complications give rise to their own special physical signs.

COURSE, DURATION, AND TERMINATIONS.—The course and duration of simple laryngeal catarrh varies considerably. Recovery is the usual termination, but the affection is very liable to recur, or may become chronic. (Edematous laryngitis is often fatal, and death may take place very suddenly or with great rapidity. Croup in children usually runs a remittent course, exacerbations occurring during the night; occasionally it is continuous. Some cases terminate within twenty-four hours, and most end within five days; they may go on, however, for ten days or a fortnight. The clinical terminations are in death or recovery. Death generally results from apnœa, but may be due to asthenia. Recovery is indicated by the subsidence of the local and general symptoms; at the same time the cough becoming looser, with

more abundant muco-purulent expectoration, or sometimes a quantity of exudation being expelled.

DIAGNOSIS.—The diagnosis between throat and laryngeal affections has already been pointed out when describing the former. In children acute laryngeal inflammations have to be distinguished from whooping-cough; bronchial catarrh with a tendency to spasm; diphtheria; as well as from other conditions affecting the larynx itself, viz., laryngismus stridulus; acute exacerbations in connection with chronic diseases, such as morbid growths; the presence of foreign bodies; or external injury. Only diphtheria and laryngismus can be specially noticed here, but it is important to insist upon carrying out a thorough physical examination in all cases. Diphtheria extending to the larynx may be generally diagnosed from laryngeal inflammation by the following characters: 1. The complaint may be epidemic, or a history of contagion may be traced. 2. Premonitory general illness may have been felt for some days, with tendency to asthenia. 3. Marked throat symptoms are usually present, preceding the laryngeal symptoms. 4. The glands about the jaws are enlarged. 5. Epistaxis and albuminuria frequently occur. 6. Laryngeal symptoms are not so urgent. 7. Examination of the throat reveals the diphtheritic deposit. Laryngismus stridulus is more sudden as regards the onset and cessation of the paroxysms of dyspnoea, and these are often brought on by some obvious cause. A history of previous similar attacks can generally be obtained. There may be signs of general convulsions, with turning in of the thumbs. The characteristic cough of croup is not present, but the child often cries. There is complete restoration between the paroxysms. Pyrexia is absent.

It is necessary to distinguish between the different forms of laryngitis. Laryngeal catarrh is most common in adults; has less severe symptoms, and no croupous cough, but more abundant expectoration; there is but little pyrexia; much nasal catarrh is often present. Œdematous laryngitis is rare in children except as the result of drinking boiling water. It generally supervenes upon some previous disease of the larynx. Expiration is comparatively easy. Cough soon becomes completely aphonic, and voice is lost. The Œdematous parts may be seen or felt. It is by no means easy in many cases to recognize the nature of an inflammatory croupy attack in children. Catarrhal laryngitis, may, however, be often distinguished from true croup by the fact that the patient is subject to similar attacks in cold seasons; while the symptoms are less severe and more remittent; and the termination is rarely fatal. The expulsion of false membrane is a certain indication of croupous laryngitis. Laryngoscopic examination might afford some aid in the diagnosis of the several forms of laryngeal inflammation.

PROGNOSIS.—All forms of laryngitis are to be regarded as serious. The Œdematous variety is very grave, especially that form which is due

to the swallowing of boiling liquids. Croup is a most fatal disease. The prognosis is worse in young infants; and is more dangerous in proportion to the severity and persistence of the local symptoms, the degree of interference with respiration, and signs of blood-poisoning. Early treatment gives a better chance of recovery.

TREATMENT.—There are certain general matters which it is essential to attend to in the treatment of all the varieties of acute laryngeal inflammation. The patient should remain in a warm room, the temperature being kept uniformly at 65° or higher, and the air rendered moist by means of steam. In the case of children it is advisable to make a tent over the bed, as described under diphtheria, and it may be necessary to raise the temperature of the air considerably. All exposure must be avoided, the throat and chest being warmly covered. Rest to the larynx is imperative, so far as it can be obtained, and in many cases it is requisite to urge patients to restrain cough as much as possible.

In the case of adults the assiduous employment of inhalations of steam is one of the chief measures to be adopted, and Dr. Morell-Mackenzie recommends the addition of some tincture of benzoin, hop, or conium juice to the boiling water, or a few drops of chloroform occasionally if there is much spasm. If the attack results from a cold, it is desirable to excite diaphoresis by means of warm drinks, a hot or vapor-bath, and external warmth. The diligent employment of hot applications over the front of the neck is useful, such as a sponge dipped in boiling water and then squeezed dry. Some prefer cold applications. If the inflammation is advancing, and especially if it has spread from the throat, it is recommended to apply directly and efficiently a solution of some astringent, either with a brush or sponge, or by the aid of an atomizer. Nitrate of silver, alum, tincture of iron, chloride of zinc, and tannin are the substances chiefly employed. In some cases an emetic of sulphate of zinc at the outset is decidedly useful, but the former practice of giving repeated depressing emetics, bleeding, blistering, and administering calomel is most objectionable. Occasionally it might be advisable in severe cases to apply a few leeches over the upper part of the sternum.

The bowels should be kept freely opened, and a diaphoretic saline mixture given. If there is much unnecessary distressing cough, some sedative may be administered with due precautions, such as a few drops of tinct. camph. co. or liq. morphine.

The treatment of children must be similar, whatever the nature of the inflammation may be, and it is necessary to be very prompt in attending to the first indications of anything wrong with the windpipe in such subjects. A warm bath should be employed immediately, and the patient be then dried and wrapped up in blankets, while hot sponges are constantly applied to the throat. The persistent use of cold compresses has been advocated, and is certainly deserving of more extended trial.

If the symptoms are at all severe, unquestionably great relief often follows the action of an emetic, though Niemeyer affirmed that "they are only indicated where obstructing croup-membranes play a part in producing the dyspnoea, and when the child's efforts at coughing are insufficient to expel them." Tartar emetic and ipecacuanha are preferred by many practitioners, and may be given to robust children, but sulphate of zinc or copper answers best in weakly subjects.

Bleeding has been extensively practiced in croup, but it should not be had recourse to as a mere routine measure. Leeches are often useful in the case of healthy plethoric children at an early period, especially if there are signs of local blood-stasis. They are best applied over the upper piece of the sternum, the number being regulated according to circumstances. Notwithstanding the high authority by which the regular administration of calomel is supported, I have never seen any good result from it in this disease, but have more than once known it do a great deal of harm, and therefore feel obliged to express my decided objection to its employment. It may be advantageous to give one dose of this drug as a purgative at the commencement. The bowels should be kept freely open, and for this purpose enemata answer best. It is difficult to determine what internal remedies are most serviceable in the treatment of laryngeal inflammation in children, but it has appeared to me that most benefit is derived at first from salines with small doses of tartar emetic or ipecacuanha wine. The cough must be rather encouraged than checked, unless it is unduly severe, and therefore sedatives are generally contraindicated. Later on stimulant expectorants are required, such as ammonia with chloric ether and syrup of squills. Some recommend the administration of alkaline carbonates or chlorate of potash. Dr. Ringer employs tincture of aconite.

Counter-irritation is not attended with much benefit, but Dr. Squire considers the application of tincture of iodine to the sides of the neck of some service, especially if covered with water-dressing.

The dieting is often of much importance. At first the food should consist chiefly of milk, with cooling drinks, but nourishing soups or meat-juices are required when the system shows any signs of failure. Alcoholic stimulants are not usually needed unless there is some pulmonary complication. If nourishment cannot be taken, it may be necessary to have recourse to nutrient enemata.

The question of *tracheotomy* is in many cases one of the greatest moment. It seems to me that if the symptoms increase in gravity in spite of treatment, and if signs of apnoea set in, the operation ought to be performed without delay, as affording the only chance of recovery, due care being taken both in its performance and in the subsequent treatment.

For œdematous laryngitis the remedies are emetics which act with

rapidity; the constant sucking of fragments of ice; efficient scarification; or, in case of need, tracheotomy.

Secondary croup calls for the administration of stimulants and abundant nutriment. Tincture of steel and mineral acids are the most efficient medicines in this affection.

Complications must be treated as they arise. Signs of apnoea must be combated by the usual measures. It is necessary in cases of recovery to exercise great care during convalescence. As prophylactic measures in those subject to croup, cold washing of the throat and chest, with dry friction afterwards; the wearing of proper clothing; and the avoidance of cold damp winds and night air, are the chief things to be attended to.

II. CHRONIC LARYNGITIS—CHRONIC LARYNGEAL CATARRH.

ETIOLOGY.—This affection may arise as a sequel of acute laryngitis, but its chief causes are: 1. Excessive use of the voice, as in speaking, shouting, or singing. It constitutes the chief morbid condition in "clergyman's sore throat." 2. Phthisis and syphilis. 3. Irritation extending from the throat. 4. Some local irritation in the larynx, especially from ulcers and growths; and also external pressure upon this tube. 5. Irritation of the recurrent nerve. 6. Habitual inhalation of irritant particles. 7. Chronic alcoholism and excessive smoking. 8. Occasionally general plethora; or a peculiar constitutional condition attended with a disposition to chronic catarrhs.

ANATOMICAL CHARACTERS.—These differ according to the duration, seat, and extent of the affection, and the variety it assumes. More or less hyperæmia is generally observed, and the vessels may be evidently enlarged, especially in the form known as "phlebectasis laryngea." The membrane tends to become thickened and firm, as well as the sub-mucous tissue, particularly in phthisis and syphilis. Sometimes there is chronic œdema. The surface is either dry and shining, or presents small collections of mucus or more abundant secretion. In *glandular* or *follicular* laryngitis, which is the condition present in "clergyman's sore throat," the morbid changes are chiefly confined to the *racemose* glands of the larynx, these being enlarged and red. The canal of the air-tube may be much dilated or contracted, particularly in phthisis and syphilis, its various parts being in some cases much altered in shape and appearance, and its surface uneven. Erosions and ulcerations are common. Sometimes hæmorrhage occurs. In phthisis a chronic œdema of one or both ary-epiglottic folds is often observed, which is pathognomonic. They look like pale, solid, pyriform enlargements, the large ends lying against each other in the middle line, and the small ones directed upwards and outwards.

SYMPTOMS.—In many cases unpleasant and irritating sensations are

experienced in the larynx, which are worse after speaking, but they are not usually marked. Alterations in the voice constitute the most important and not uncommonly the only symptom of this disease. This is more or less weakened to complete aphonia; often hoarse and harsh, deep-toned, or cracked. It is subject to variations, and in the slighter cases frequently improves if the patient speaks for a time. The changes in the voice may only be noticed during loud talking. Paroxysms of spasmodic cough cause much distress in some cases, but this symptom may be completely absent. Many patients have a short, tickling cough; others hawk frequently, in order to clear away viscid secretion. The cough may be hoarse, cracked, barking, or aphonic, and is sometimes attended with much expectoration. Breathing is only disturbed when there is much thickening of tissues or œdema, with consequent narrowing of the larynx, and then there may be considerable dyspnoea, with stridulous inspiration. A little dysphagia is sometimes experienced.

The laryngoscope reveals the precise appearances presented by the larynx, and may show that the muscles of the glottis do not act properly. Sometimes mucous râles may be heard with the stethoscope.

There are no general symptoms directly due to chronic laryngitis, but the system is often affected, owing to some other local or constitutional affection.

This disease frequently aggravates the symptoms associated with other organic mischief in the larynx, such as ulceration or morbid growths.

III. ULCERS OF THE LARYNX.

The forms of ulceration which are met with in the larynx include:

1. Superficial catarrhal. 2. Follicular. These are chiefly associated with chronic laryngitis. 3. Variolous, resulting from small-pox pustules. 4. Ulcers in connection with typhus and typhoid fever, which generally spread extensively and deeply. 5. Phthisical or tubercular. Laryngeal ulcers in phthisis do not by any means always originate in tubercle. Usually they are minute and circular at first, being often observed at the back of the ventricular bands, and on the under surface of the epiglottis; by their union they give rise to large and irregular ulcerations, which may spread extensively. Sometimes ulceration begins on the vocal cords. Generally it does not cause deep destruction of tissues, but it may do so. The epiglottis is often eroded at its margins, and its cartilage may be exposed or perforated. Calcification and necrosis of the cartilages not unfrequently follow phthisical ulceration. 6. Syphilitic. Occasionally secondary syphilitic ulcers are met with, which are limited, superficial, and may occur in any part. Tertiary ulcers exhibit a special tendency to begin on the epiglottis; they spread rapidly, both in extent and depth, causing great destruc-

tion of tissues, and presenting irregular ragged edges. In some cases the ulceration invades upon the larynx from the throat; it may originate in the breaking down of gummata. Sometimes it extends at one part, while cicatrizing at another. The scars have a great tendency to contract and narrow the calibre of the larynx, or cause adhesion and distortion of structures. 7. Cancerous. These are very rare.

SYMPTOMS.—In the slighter cases there are often no special symptoms; and the same remark applies to those ulcerations which are associated with the acute fevers.

Painful sensations may be felt in the larynx, of a burning, smarting, or pricking character, increased by coughing or speaking, with tenderness on pressure. Deglutition is difficult or painful if the epiglottis is involved, especially as regards liquids. The voice is often altered in quality, being harsh, hoarse, or cracked, as well as weak. Suffocating fits of cough are common, and pus, blood, or laryngeal tissues may be expectorated. Breathing is frequently noisy and of laryngeal characters, and there may be urgent dyspnœa. In many cases the throat is simultaneously affected. Cicatrization of an ulcer may give rise to signs of permanent stricture.

IV. MORBID GROWTHS IN THE LARYNX.

The abnormal growths and tumors which may be found in the larynx are either *malignant* or *non-malignant*. The *malignant* growths include: 1. Epithelial. 2. Encephaloid. 3. Scirrhus. All are very rare, epithelial being the most common, and they usually extend to the larynx from other parts. The *non-malignant* comprise: 1. Syphilitic condylomata and mucous tubercles. 2. Papillomata. 3. Mucous polypi or fibro-cellular tumors, either pedunculated or not. 4. Fibrous tumors or polypi. 5. Cystic growths. 6. Lipomata. 7. Erectile vascular tumors. 8. Enchondromata. 9. Hydatids. Those last mentioned are of extremely rare occurrence.

SYMPTOMS.—The size, situation, number, and nature of the morbid growths, as well as the size of the larynx, will necessarily influence the local symptoms. Rarely is there any pain, but occasionally a feeling of a foreign body is experienced, or a sense of obstruction or uneasiness. Dysphagia is sometimes present. The voice is often partially or completely lost and altered in quality, and is liable to sudden changes. More or less dyspnœa is usually felt, while the breathing may be stridulous; this symptom is also subject to rapid variations, and frequent suffocative attacks may come on, which are due to spasm. When the growth is above the glottis, expiration is often quite free. The removal of part of a growth may increase the dyspnœa, in consequence of its position being disturbed. Cough is present in many cases, varying in its characters, and it is not unfrequently voluntarily excited with the

view of getting rid of the obstruction. In the expectoration, which is usually increased and abnormal, fragments of the growth are sometimes expelled, but Dr. Morell-Mackenzie states that the microscopic examination of these cannot be relied upon for differential diagnosis. Laryngoscopic examination reveals the nature and seat of any growth. Sometimes it extends through the upper opening of the larynx, so as to be visible on inspection of the throat. A characteristic valvular murmur has been described as being heard over the larynx during breathing, but this is not reliable. Examination of the chest often reveals obstruction to the entrance of air into the lungs.

The mere interference with the function of respiration is liable seriously to affect the general system; and if the growth is cancerous, the usual cachexia is often observed.

V. ŒDEMA GLOTTIDIS.

ETIOLOGY.—The loose submucous tissue which is present in some parts of the larynx is very liable to become the seat of œdema, which may arise under the following circumstances: 1. In connection with acute laryngitis, especially that due to local irritation. 2. From the irritation induced by chronic laryngeal diseases, *e. g.*, ulcers, growths, necrosis of cartilages. 3. As a complication of some of the acute specific fevers, *viz.*, scarlatina, erysipelas, small-pox, typhus, and typhoid. 4. By extension of inflammation from the throat. 5. Occasionally as a part of general dropsy from renal disease; and possibly from cardiac or venous obstruction.

The *symptoms* are similar to those described as indicative of *œdematous laryngitis*.

VI. LARYNGEAL PERICHONDritis—ABSCESS—NECROSIS OF THE CARTILAGES.

These rare morbid conditions may be briefly considered together. In perichondritis an exudation is said to collect between the perichondrium and cartilages, especially the cricoid, and afterwards pus forms, while the cartilages necrose, and are finally discharged in fragments. The irritation may lead to abscesses in the parts around.

Usually these changes are associated with ulceration; necrosis of the cartilages is by far most frequent in phthisis. Syphilis, abuse of mercury, low fevers, and cold have been set down as very rare causes.

SYMPTOMS.—These are considerable limited pain; extremely irritable cough; marked alterations in voice; usually severe dyspnoea; followed by expectoration of fragments of cartilage, and signs of abscesses.

VII. FUNCTIONAL OR NERVOUS AFFECTIONS OF THE LARYNX.

1. DISORDERS OF SENSATION.—The larynx is occasionally the seat of hyperæsthesia with irritable cough; neuralgia, or more or less diminution in sensibility, which may amount to complete anæsthesia.

2. LARYNGISMUS STRIDULUS—SPASM OF THE GLOTTIS—SPASMODIC CROUP—SPURIOUS CROUP—CHILD-CROWING.—This condition results from a spasmodic action in connection with the glottis-closers, the proximate cause being some irritation conveyed by the laryngeal nerves. The irritation may be—1. *Centric*, originating in the brain, either from some organic mischief, *e. g.*, hydrocephalus; or disturbance of its circulation or nutrition. 2. *Direct*, from irritation of the vagus or recurrent nerves by enlarged glands, tumors, or other morbid conditions. Formerly the complaint in children was called “thymic asthma,” on the assumption that it was due to pressure by an enlarged thymus gland. 3. *Reflex*. The reflex irritation may arise in the larynx itself; or be associated with dentition, improper feeding, especially in the case of infants brought up by hand or nursed by unhealthy mothers, worms, a cold draught blowing on the skin, and various other disturbances.

Laryngismus stridulus is a very common complaint in children, especially during the first and second years. In adults it is only rarely observed, in connection with hysteria, or as the result of pressure on the laryngeal nerves by aneurisms and other tumors, or direct irritation by foreign bodies or gases. The complaint is most frequent among male children, and among those living in the crowded parts of large towns and cities, especially if brought up by hand and exposed to unfavorable hygienic conditions. Scrofulous children are said to be more subject, and rickets decidedly predisposes to the affection. It has been suggested that in the latter disease the laryngismus is due to pressure upon the brain when the child lies on its back, owing to the thinness of the occipital bone.

There may or may not be some obvious *exciting cause of an attack*. Thus it sometimes comes on during the act of swallowing; from tossing up the child in the air; or from severe mental emotion, especially fright or anger.

SYMPTOMS.—In children the attack in most cases comes on at night during sleep, and is very sudden in its onset. The prominent symptom is dyspnœa, more or less intense, attended usually with stridulous, crowing inspiration, but the glottis may be for a moment completely closed, so that no air can enter, and respiration ceases entirely. The child struggles for breath, and presents to a greater or less degree the appearances due to apnœa. Often there are general convulsions, with “carpopedal” contractions, strabismus, and sometimes involuntary discharge of feces and urine. The attack subsides suddenly or very

rapidly, and in many cases the child cries. Restoration is complete, and there is no affection of the voice, or cough. Pyrexia is usually absent.

An essential character of this complaint is the great tendency to the recurrence of the attacks. They vary in frequency, duration, and severity, but tend to become more frequent, longer, and more intense as the case progresses. Ultimately death from suffocation not unfrequently occurs during one of the attacks.

The spasmodic affections in adults do not call for particular remark. Hysterical cough is believed to be sometimes due to a spasmodic tendency in the adductors of the cords during expiration; and the sharp ringing cough which occasionally affects children is supposed to have the same cause, the spasm being reflex (Morell-Mackenzie).

DIAGNOSIS.—The only affection likely to be mistaken for laryngismus is inflammatory croup, and the diagnosis between them has already been pointed out.

PROGNOSIS.—Most reflex cases recover, but those due to other causes are very serious. Much will depend upon the state of health of the child, and the severity and frequency of the fits.

TREATMENT.—During a paroxysm of laryngismus in children, measures must be immediately adopted for the relief of the spasm. Slapping or rubbing the back; shaking the child; dashing cold water in the face; fanning; tickling the throat so as to excite vomiting; a warm bath alone or with cold douching while in it; and holding ammonia to the nostrils, are the most effectual measures. A rapid emetic is useful if it can be taken; and if the attack persists, enemata of assafoetida or valerian may be employed, sinapisms being also applied to the chest. Artificial respiration is sometimes serviceable. At the same time it is most essential to seek for any source of reflex irritation and remove this; for instance, lancing the gums often gives speedy relief. In prolonged cases inhalation of chloroform may be carefully tried, and sometimes it is necessary to have recourse to tracheotomy, which may be performed even after apparent death.

During the intervals it is important to look to the diet; to the state of the alimentary canal; and to the general health; improving these if required. Tonics, change of air, and salt-water bathing often do much good.

In adults the main indications are to remove the cause of any spasm; and to use sedative inhalations.

3. LARYNGEAL PARALYSIS. PARALYSIS OF THE MUSCLES OF THE VOCAL CORDS.—Paralysis of the muscles of the larynx may arise: 1. As the result of some local organic mischief, past or present. 2. From pressure upon or traction of the pneumogastric or recurrent nerves, one or both, by tumors, enlarged glands, etc. 3. After diphtheria; and, rarely, after typhus or intermittent fever. 4. In connection with

hysteria, especially if there is much debility. 5. From chronic poisoning by lead or arsenic. 6. Very rarely from centric disease in the brain or upper portion of the spinal cord. 7. As a consequence of atrophy and degeneration of the muscles.

VARIETIES AND SYMPTOMS.—Four chief varieties of laryngeal paralysis are described, viz.:

(i.) *Bilateral paralysis of adductors*—*Hysterical or functional aphonia*. Voice is lost, but cough is usually attended with sound. The patient sometimes speaks in a scarcely audible whisper. The laryngoscope shows that the vocal cords remain apart, either partially or entirely, during attempted phonation; and they may be perfectly motionless.

(ii.) *Unilateral paralysis of adductors*. Voice is altered, and there may be a permanent falsetto. The sound produced during coughing, sneezing, or laughing, is usually much changed and weakened. The laryngoscope reveals that one cord does not act when the patient attempts to speak or cough, and that it is generally congested. This form of paralysis is usually due to some direct cause acting upon the supplying nerve.

(iii.) *Bilateral paralysis of adductors*. Here the prominent symptom is dyspnœa, with noisy, stridulous inspiration, always present more or less, but subject to severe exacerbations, especially after exertion or on making a deep inspiration. Voice is not much affected, but may be harsh. Laryngoscopy discloses that the cords lie close together near the median line, and do not separate when an inspiration is made. Some consider that this is the pathological condition in laryngismus stridulus, and not spasm.

(iv.) *Unilateral paralysis of the adductors* is attended with some dyspnœa and noisy breathing; and the affected cord does not move during breathing, but remains near the median line.

In some cases both sets of muscles are involved, there being a combination of the symptoms and signs described above, which is usually the case in connection with pressure on the recurrent nerves. In rare instances, only a single muscle is paralyzed, and then the voice may merely be somewhat altered, being monotoned, or some notes not being capable of production.

VIII. GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF CHRONIC LARYNGEAL AFFECTIONS.

DIAGNOSIS.—When symptoms indicate some chronic disorder in connection with the larynx, the diagnosis has to be made between: 1. Mere functional disturbance. 2. Pressure or irritation affecting the air-tube directly or its nerves. 3. Organic disease, of which, if present, it is requisite to determine as accurately as possible the nature, seat, and extent. The chief points to be taken into consideration are: 1.

The personal and family history of the patient, as revealing any constitutional diathesis. 2. The existing evidence of constitutional disease, especially phthisis, syphilis, or cancer; or of a hysterical condition. 3. The exact local symptoms present, particularly as regards respiration and voice. 4. Whether any signs of phthisical disease of the lungs can be discovered on careful physical examination, or if such examination reveals any morbid condition which might affect the wind-pipe or its nerves. 5. The results of laryngoscopic examination. Of course it is only by the employment of this instrument in a satisfactory manner that positive and accurate information can be obtained.

PROGNOSIS.—All organic laryngeal affections are troublesome, and some of them highly dangerous, especially extensive ulceration; great thickening of tissues; destruction of the cartilages; and certain morbid growths, or such as cannot be removed. The danger is in proportion to the degree of interference with breathing, and the liability to spasm. In many cases there is no fear of a fatal result, but the prognosis as regards the restoration of the functions of the larynx is unfavorable. Much will depend upon the constitutional condition. Syphilitic disease may often be rapidly cured under proper treatment. Laryngeal phthisis is very serious and intractable as a rule. Cancer is necessarily fatal. With respect to the functional disorders, paralysis of the adductors is favorable as a rule; that of the abductors very unfavorable, the patient being in great danger. The cause of the paralysis will necessarily influence the prognosis.

TREATMENT.—Rest to the larynx as far as possible; a dry atmosphere, of warm and uniform temperature; the removal of all causes of local irritation; the stoppage of any injurious habit, such as excessive smoking; and the wearing of sufficient warm clothing over the neck and chest, are the principal general matters requiring attention in the treatment of any organic laryngeal disease. In some cases a change of climate is imperative, if it can be obtained; but if not, a respirator should be worn, at the same time damp, cold, and especially night air being avoided.

Constitutional treatment is often of great importance, especially for syphilitic and phthisical affections. In many cases of chronic laryngitis tonics are useful, or treatment directed to the alimentary canal. Various German waters and those of the Pyrenees are recommended in obstinate cases. Sometimes deglutition is much affected, owing to the condition of the epiglottis, especially in laryngeal phthisis, and then particular attention is required as regards the feeding of the patient, care being taken that a sufficient quantity of nutriment is consumed. It is useful in these cases to thicken liquids with corn-flour or arrow-root. Sometimes the food must be administered through an œsophageal tube or by enema.

Local treatment is, however, in most cases that requiring the chief

attention in laryngeal diseases. Remedies are best applied by means of a camel's-hair brush attached to a bent handle; inhalation or the spray-inhaler; or by blowing in powders. Lozenges are very useful if the throat is affected at the same time. The applications should be made effectually, regularly, and as frequently as each individual case may require, the laryngoscope mirror being made use of to give light. The chief substances employed are: 1. Mineral astringents and caustics, viz., nitrate of silver; chloride, sulphate, or acetate of zinc; alum and chloride of aluminium; perchloride of iron; sulphate of copper. 2. Vegetable astringents, such as tannin or kino. 3. Volatile stimulating liquids in inhalations, viz., creasote, carbolic acid, oil of pine or juniper. 4. Sedatives in inhalations, especially conium, tincture of benzoin, ether, or chloroform. Glycerin is the best solvent when any remedy is applied with the brush. Different applications are required in different cases, but Dr. Morell-Mackenzie finds chloride of zinc one of the most useful mineral astringents in chronic laryngitis. Tannin is very valuable in phthisis; and nitrate of silver in syphilitic ulceration.

As regards growths, these necessarily require removal by operation. Evulsion is the chief method of operation usually; but it is needless to enter into any description, as only those who have had considerable practical experience would be likely to undertake it. Even cancer may sometimes be removed with temporary benefit. Caustic remedies are of no value, except for the destruction of condylomata. The galvanic cautery has been employed in the treatment of laryngeal growths.

Not uncommonly *tracheotomy* is called for in order to prevent suffocation, in cases of extensive ulceration, morbid growths, or great thickening and contraction, and the results are sometimes very satisfactory. Subsequently it may be desirable to remove a growth by dividing the thyroid cartilage.

In all cases where there is liability to laryngeal disease, every precaution must be taken to guard against its development. In phthisis the least indication of any laryngeal irritation should lead to prompt treatment.

For laryngeal functional disorders general treatment is often indicated. All obvious causes of irritation must be removed if possible. Local Faradization is the great remedy in paralysis of the adductors, one pole being placed over the thyroid or cricoid cartilage, and the other in contact with the vocal cords. Paralysis of the abductors usually requires tracheotomy in order to avert suffocation.

CHAPTER VII.

DISEASES OF THE BRONCHI.

I. ACUTE BRONCHIAL CATARRH—ACUTE CATARRHAL BRONCHITIS.

ETIOLOGY.—*Predisposing Causes.* These are: Early or advanced age; indulgence in relaxing and enervating habits; immoderate clothing of children; debility from any cause; the presence of constitutional disease, *e. g.*, rickets, tuberculosis, gout; chronic pulmonary affections or previous attacks of bronchitis; cardiac affections or other conditions which induce overloading of the bronchial vessels; a cold and damp climate or season, especially if liable to sudden changes of temperature; occupations involving exposure, rapid changes in temperature, or the breathing of irritating particles; and residence in the poorer and unhealthy districts of large towns.

Exciting Causes. 1. In the great majority of cases bronchitis results from "taking cold" in some way or other, such as by exposure to cold and wet, sitting in a draught when perspiring, sudden change in temperature, wearing damp or insufficient clothing, or sleeping in a damp bed. Undoubtedly many children suffer in consequence of the legs and lower parts of the body being so often left unprotected. 2. Direct irritation of the bronchial mucous membrane is another frequent cause, by very hot or cold air; irritant gases; mechanical particles in the inspired air; *e. g.*, cotton-wool, dust, steel; blood; irritating secretions; or morbid growths, *e. g.*, tubercle and cancer. 3. Blood-poisoning may induce bronchial catarrh, as in various fevers, especially typhoid and measles; gout, rheumatism, or syphilis; after the sudden disappearance of acute or chronic skin affections, or the suppression of habitual discharges; or during the administration of certain medicines, especially iodine. 4. Bronchitis occurs epidemically associated with influenza.

ANATOMICAL CHARACTERS.—The morbid appearances directly indicating bronchial catarrh are redness, varying in its hue and arrangement; swelling, opacity, relaxation, and loss of consistence of the mucous membrane; at first dryness of the surface, soon followed, however, by excessive secretion, which changes in its characters as the case progresses, consisting at first of clear frothy mucus, but afterwards becoming more opaque and viscid, muco-purulent or purulent, owing to the abundance of cells; often epithelial abrasions, or even slight ulcerations. Occasionally blood is present in the tubes; or fibrinous particles or casts.

The appearances will necessarily vary considerably according to the extent, severity, and stage of the disease. The redness is most marked towards the upper part of the lungs, and at the bifurcations of the bronchi, but is rarely perceptible beyond their fourth or fifth divisions, and it may disappear after death, owing to the contraction of the muscular and elastic fibres. The inflammatory products are most abundant towards the basis, and in the dependent parts of the lungs; by their accumulation in the air-cells and minute bronchi they sometimes give rise to yellow spots near the surface, especially in children. Both lungs are usually affected, but to an unequal degree.

As complications associated with bronchitis the chief conditions observed are pulmonary congestion and œdema; lobular or more extensive collapse; acute emphysema or insufflation; lobular or rarely lobar pneumonia; and pleurisy. The venous portion of the circulation is overloaded with dark blood. The bronchial glands are often red, soft, and enlarged.

SYMPTOMS.—It will be necessary to allude to certain varieties which acute bronchitis presents in its clinical history, but in a general way the local symptoms may be summed up as: unpleasant or painful sensations in the chest; interference with breathing; cough, with expectoration of the materials formed in the tubes. More or less pyrexia is almost always present; and in some cases there is a tendency to suffocation, from blocking up of the bronchial tubes; in others to adynamic symptoms.

1. PRIMARY OR IDIOPATHIC BRONCHITIS.—1. *Involving the larger and medium-sized tubes.* When due to a cold the complaint is usually ushered in by coryza, sore throat, and some hoarseness; chilliness or slight shiverings, alternating with a sense of heat; general pains and languor; drowsiness with restlessness; furred tongue, anorexia, and constipation. Occasionally slight delirium is observed; or in very young and weakly children convulsions may occur. The symptoms of the established disease are local and general.

Local.—Subjective sensations of heat, burning, rawness, soreness, tickling, or actual pain are experienced to a greater or less degree over the front of the chest, but especially behind the upper part of the sternum and in the suprasternal notch. These are increased by a full inspiration, and a cough often gives rise to much tearing pain. There may be tenderness over the sternum. Muscular pains are common as the result of cough, especially towards the sides and base of the chest. A sense of oppression, weight, or tightness in the chest is felt, and respiration may be somewhat hurried and laborious, but there is no evident dyspnoea. Cough is a prominent symptom, being due at first to the irritable condition of the membrane, and subsequently to the secretions in the tubes. It is paroxysmal, often irrepressible and violent, especially on lying down and waking up in the morning. Expectoration soon

occurs, the sputa consisting at first of a little clear, thin, frothy mucus; but afterwards increasing in quantity and becoming muco-purulent, more or less opaque, viscid, and scarcely aerated. Sometimes they are very tenacious and adhesive or ropy, and may form distinct "nummulated" masses. As they alter in their characters they are more easily expelled. Occasionally the expectoration is streaked with blood. Under the microscope epithelial cells, numerous young cells, exudation- and pus-corpuscles are the chief elements observed; with abundant granular and molecular matter; and sometimes a few blood-disks, fibrinous coagula, or crystals.

General.—If the bronchitis is at all extensive, a certain degree of fever is present, but it is never very marked. The patient frequently feels very languid and weak. Other mucous surfaces are often the seat of catarrh.

2. *Bronchitis Extending into the Minute Tubes.*—*Capillary Bronchitis.* In most cases this form is but an extension of that already described, being preceded by its symptoms, but sometimes the smaller tubes seem to be affected at the same time as the larger or quite independently, and then well-marked rigors may occur at the outset, with headache and vomiting. The peculiar features of capillary bronchitis are as follows: 1. Pain is often slight or absent, except the muscular pains resulting from cough, which are very severe. 2. Respiration is always greatly disturbed, being accelerated sometimes to fifty or more per minute, wheezing or crepitous, attended with effort and with a considerable sense of want of air. The pulse-respiration ratio is altered, being in some instances about 2.5 to 1. Urgent dyspnoea is observed in severe cases, either constant or paroxysmal, which may amount to orthopnoea. 3. Cough is exceedingly frequent and violent, and during the act patients often sit up or bend forward and hold their sides. 4. Expectoration is very difficult, the sputa being abundant, usually viscid and tenacious, containing also minute fibrinous casts of the tubes. 5. The general symptoms are of an aggravated character, there being at first considerable fever, the temperature occasionally rising to 103° or more, with much exhaustion and weakness. The urine sometimes contains a little albumen or a trace of sugar. As the case advances, the tendency is to the development of the usual symptoms indicating suffocation and venous congestion, usually gradual in their onset, occasionally rapid or sudden owing to the filling up of the tubes, the cough diminishing, the breathing becoming shallow, and the expired air cool. In some instances, however, typhoid symptoms set in; or there may be a combination of both classes of phenomena.

It is necessary to allude to some individual peculiarities. Children are very liable to show signs of deficient blood-aeration, even in the slighter cases, especially if they are feeble and badly nourished or rickety, because they cannot expel the sputa. They usually swallow

these, and, therefore, in order to examine them it is necessary to wipe the base of the tongue with a handkerchief after a cough. Healthy adults do not suffer nearly so severely as a rule. In aged persons, or those who are constitutionally weak from any cause, the fever is very apt to assume an adynamic type, even though the bronchitis is not extensive. The term "peripneumonia notha," formerly much employed, properly includes cases of capillary bronchitis occurring in old or weak subjects after some chronic malady, attended with febrile symptoms at first, but signs of adynamia and deficient aeration of blood setting in at an early period.

II. SECONDARY BRONCHITIS.—This term is applied to bronchitis occurring in connection with the exanthemata; blood diseases, *e. g.*, gout, rheumatism, Bright's disease; or chronic lung or heart affections. In nearly all these conditions it is apt to come on very insidiously, without any of the usual symptoms being prominent, and is often a dangerous complication. The expectoration is said sometimes to contain peculiar materials which accumulate in the blood, *e. g.*, uric acid in gout. Lung-deposits usually give rise to localized bronchitis. When acute bronchitis complicates emphysema and chronic catarrh, especially if associated with cardiac disease, urgent dyspnoea and signs of apnoea are likely to set in speedily, with general venous congestion and dropsy; expectoration is also very abundant and frothy at first.

III. MECHANICAL BRONCHITIS.—When due to the inhalation of irritant particles, the attacks of bronchitis are frequent but comparatively slight, there being no pain or fever, but an irritable cough with but little expectoration, which may contain some of the particles breathed.

IV. EPIDEMIC BRONCHITIS has been already described in connection with influenza.

It must be remembered that the complications previously mentioned may be present, modifying the symptoms as well as the physical signs, which are now to be considered.

PHYSICAL SIGNS.—1. The chest may be somewhat enlarged from distension of the lungs. 2. Respiratory movements are more or less quick, frequent, and deep; expiration is sometimes prolonged; and if the tubes are extensively filled the upper part of the chest moves unduly. In children signs of inspiratory dyspnoea are very common. 3. Rhonchal fremitus is frequently present, varying in its characters. 4. Percussion may reveal increase in extent and degree of pulmonary resonance from distension; or occasionally some deficiency of resonance at the bases is observed, due to accumulation of secretion, congestion, and oedema, or collapse. In infants a sound resembling the "bruit de pot fêlé" may be frequently elicited. 5. Respiratory sounds are loud and harsh with prolonged expiration, where the tubes are free; where obstructed they are weak or absent, or they may be completely obscured by rhonchi. 6. The various rhonchi, due to the narrowing of the tubes

or to the fluids contained within them, constitute the important physical signs of bronchitis. They may be of sonorous, sibilant, mucous, sub-mucous, or subcrepitant character, according to the physical conditions present, and these often coexist in different parts of the chest. At first the dry râles are only or chiefly heard; while the moist are principally observed towards the bases of the lungs. When fluids collect in the larger tubes, rhonchal sounds may be audible at a distance from the patient. Cough affects them considerably. Occasionally the heart's action may cause râles.

DURATION AND TERMINATIONS.—According to its severity, a case of bronchitis may end in three or four days or go on for two or three weeks or more. Capillary bronchitis generally proves fatal from the sixth to the twelfth day, death occurring earlier in children than adults as a rule. There is always the danger of a relapse or extension of the inflammation. The terminations are: *a.* In recovery, but in severe cases, convalescence may be very prolonged, and cough is liable to remain for some time. *b.* In death, either from gradual or sudden apnœa, or adynamia. *c.* Occasionally by transition into the chronic state. As sequelæ, emphysema, pulmonary collapse, deformed thorax in children, or acute or chronic phthisis may remain.

DIAGNOSIS.—The diagnosis of the diseases of the lungs will be hereafter considered in a separate chapter. At present it need only be remarked that the chief diseases from which acute bronchitis requires to be distinguished are: hooping-cough; croup and other forms of laryngitis; pneumonia, especially lobular; and acute phthisis. It is of importance to recognize any complication occurring during the course of an attack, and also not to mistake bronchitis associated with one of the exanthemata for the sole complaint.

PROGNOSIS.—Bronchitis is a very dangerous disease, and stands high as a cause of death in this country. The circumstances which increase its gravity are: Very early or advanced age; a bad state of health, or the existence of some general chronic or acute disease; previous organic mischief in the lungs, especially extensive emphysema, or in the heart; extensive implication of the smaller tubes, with great difficulty of expectoration; signs of accumulation of materials in the tubes, with shallow breathing and cessation of cough, or of their extensive obstruction, the latter being especially looked for in children; urgent dyspnœa, with evidences of apnœa; the presence of adynamic symptoms; the occurrence of complications; neglect of treatment; and a low epidemic type.

TREATMENT.—Early attention is required in all cases of bronchitis, but especially when children are affected. Confinement to the house or even to one room is advisable, and if the case is at all severe the patient should remain in bed, warmly clad in flannel, avoiding exposure of the chest, the room being kept at a temperature of from 65° to 68°,

and it may be necessary to moisten the air with steam. When the attack results from a cold it is useful at the outset to induce free perspiration by means of copious hot drinks, a warm foot-bath, to which may be added a little mustard, or even a hot-air, vapor, or Turkish bath, the patient then going to bed and lying between blankets, covered with abundant bedclothes. A full dose of Dover's powder may be given, or a saline diaphoretic draught. A sinapism over the chest is useful, and if the larynx is at all involved steam inhalations should be employed. An emetic at the outset is in much favor with some practitioners in severe cases, and might occasionally be serviceable in the treatment of children.

Should the symptoms not subside the indications are: 1. To subdue the inflammation as soon as possible. 2. To promote the discharge of the materials forming in the tubes, and diminish their quantity if excessive. 3. To relieve unnecessary cough. 4. To allay spasm of the bronchial tubes if present. 5. To pay attention to the constitutional condition, and support the strength if it fails. 6. To treat apnoea, excessive fever, or adynamia, should either set in. 7. To attend to complications.

For fulfilling the first indication, general or local bleeding, tartar emetic, tincture of digitalis, and tincture of aconite are the chief remedies. Venesection is very rarely required or admissible, but moderate local bleeding, by means of leeches or cupping, may be occasionally beneficial, though much discrimination is necessary in adopting this measure. The front of the chest and the posterior base are the sites from which blood may best be taken. The application of two or three leeches sometimes relieves severe dyspnoea in plethoric children very satisfactorily.

Tartar emetic is decidedly valuable in the early stage of severe cases, provided the patient is strong and not too old. It may be given with liq. ammon. acet. and a few drops of tinct. camph. co., in doses of gr. $\frac{1}{4}$ to $\frac{1}{2}$ for an adult. Tincture of digitalis and tincture of aconite have been well spoken of, and are deserving of more extended trial.

The next three indications are carried out mainly by the administration, in various combinations as they are required, of *expectorants*, viz., at first vin. ipecac, tinct. or syrup scillæ, tinct. camph. co.; and later on carbonate of ammonia, chloride of ammonium, infusion of senega or serpentary, ammoniacum, galbanum, or tincture of benzoin; *sedatives* and *narcotics*, especially opium or morphia, henbane, conium, hydrocyanic acid, or chlorodyne; and *antispasmodics*, such as the various ethers, tincture of lobelia, or spirits of chloroform. Each case must be studied carefully, and the remedies varied accordingly. They may be combined with demulcents or diaphoretics. Should the tubes be much loaded and expectoration be difficult, narcotics, particularly opium, must be avoided, and the patient should lie with the head high,

and be encouraged to cough frequently, not being allowed to sleep for too long a time. It is especially necessary to attend to these matters in the treatment of children. Should there be dangerous accumulation, an emetic of sulphate of zinc is very useful. On the other hand, if there is an irritable cough, it may often be voluntarily repressed by the patient, and sedatives are then most valuable. Inhalations are frequently beneficial, those of conium, ether, chloroform, hop, or benzoin, to relieve cough and check spasm; later on those of tar, creasote, or carbolic acid, to diminish or improve the sputa.

Local treatment is generally called for. Repeated sinapisms, hot or turpentine fomentations, or linseed-meal poultices are beneficial at first; when the acute symptoms have subsided blisters may be useful, or, if there is a tendency to chronic catarrh, some more powerful application may be required, croton-oil liniment being the best. Free dry cupping frequently relieves troublesome dyspnoea and oppression about the chest, especially when acute bronchitis complicates emphysema with chronic catarrh. In these cases flying blisters and turpentine stupes are also serviceable.

The constitutional conditions chiefly requiring attention are general debility, rickets, tuberculosis, and gout. Lowering treatment is not borne when either of these is present. It is quite needless to keep patients on too low a diet, and considerable support is often called for in bad cases. Stimulants are not requisite as a rule, and may do harm, but they must be given if necessary, particularly if signs of adynamia or apnoea set in, their effects being carefully watched. Excessive pyrexia calls for full doses of quinine. Any tendency to asphyxia must be combated by the usual measures.

In the treatment of children one of the best remedies in most cases is ipecacuanha wine, in moderate doses every three or four hours. When bronchitis attacks old people, or those who are weak from any cause, or when it occurs as a secondary complication, wine or brandy and abundant nourishment are usually required, and a mixture should be given containing carbonate or muriate of ammonia, ether, or spirits of chloroform, and tincture of squills, with camphor mixture, decoction of bark, infusion of senega, or ammoniacum mixture. Capillary bronchitis in the majority of cases demands a stimulant and supporting treatment.

Proper precautions must be taken until convalescence is established, especially against cold, damp, and night air; flannel must be worn next the skin. Tonics are often useful during recovery, such as quinine, mineral acids, or iron. Due care must also be exercised in the case of those who are subject to bronchitis, and for such a change to some genial climate during the winter season is very desirable.

II. CHRONIC BRONCHITIS—CHRONIC BRONCHIAL CATARRH.

ETIOLOGY.—As a rule chronic bronchitis follows repeated attacks of the acute disease, but occasionally remains after one attack, or begins as a chronic affection. It is frequently associated with gout and other constitutional complaints, chronic lung diseases, heart affections causing pulmonary congestion, chronic alcoholism, or the breathing of irritant particles. Persons advanced in years are far most subject, but even children are liable to suffer.

ANATOMICAL CHARACTERS—When this complaint has been long established, it leads to considerable changes in the bronchial tubes. Their lining membrane becomes dark-colored, often of a venous hue, or here and there grayish or brownish, and the capillaries are visibly enlarged and varicose. Thickening of tissues; increased firmness, which may amount to much induration; and contraction are observed, with loss of elasticity and muscular hypertrophy. The cartilages may ultimately calcify. The small tubes are narrowed or closed up; the larger being often dilated and gaping on section. The surface of the membrane is uneven, frequently presenting extensive epithelial abrasions, or occasionally follicular ulcers. In some cases there is only a little tenacious mucus in the tubes, but usually they contain abundant muco-purulent or purulent matter, or frothy mucus.

SYMPTOMS.—Numerous varieties are presented in practice as regards the severity and exact characters of the symptoms of chronic bronchial catarrh, depending upon its extent, and upon its frequent association with other morbid conditions in the lungs, especially emphysema or dilated bronchi and phthisis; with cardiac affections; or with some constitutional diathesis. Cases of this complaint may, however, be classed under three groups:

1. In many instances patients only suffer during the cold season, having a "winter cough;" but after awhile the symptoms become permanent to a greater or less degree, being liable to exacerbations in cold and damp weather. A little uneasiness or soreness is often felt behind the sternum, increased by coughing; but there may be none at all. A sense of oppression about the chest, with shortness of breath on exertion, is usually present in severe cases. Cough is the main symptom, occurring chiefly in paroxysms, varying greatly in severity and frequency; it is often very annoying on first going to bed and early in the morning. It is attended with expectoration, the sputa being frequently difficult to expel and abundant, consisting of grayish mucus, yellowish or greenish muco-purulent or purulent matter, or a mixture of these, usually running into one mass, but occasionally remaining in separate lumps, which may be "nummulated." Being but slightly ~~separated~~ the masses not unfrequently sink in water. Occasionally blood-streaks are observed. Sometimes a most offensive or gangrenous

odor is given off, supposed to be due to decomposition of the sputa or to microscopic sloughs. The microscope reveals much granular matter, with imperfect epithelial and pus-cells, and often blood-corpuscles.

Severe cases may be attended with considerable wasting and debility, as well as slight evening pyrexia and night-sweats.

2. *Dry Catarrh. Dry Bronchial Irritation.*—This variety is particularly observed in connection with gout, emphysema, or irritant inhalations, and in seaside places. More or less dyspnœa, with tightness across the chest, is felt, and very distressing paroxysms of irritable cough come on, either quite dry or only followed by the expectoration of a small pellet of grayish, pearl-like, tough mucus, compared to boiled starch, or of a little watery fluid.

3. *Bronchorrhœa.*—Most frequent in old people, especially in connection with cardiac diseases, this form is characterized by the expectoration being very considerable in amount, sometimes as much as four or five pints in the twenty-four hours; either watery and transparent, or glutinous and ropy, resembling a mixture of white of egg and water, and scarcely at all frothy. The cough is paroxysmal and often violent, but may be insignificant compared with the quantity of fluid discharged. Patients frequently obtain relief from dyspnœa and other unpleasant sensations after a spell of coughing. In severe cases there may be loss of flesh and proportionate weakness.

PHYSICAL SIGNS.—The only signs directly due to chronic bronchial catarrh are: 1. Rhonchal fremitus. 2. Harsh respiratory sounds, often weak, with prolonged expiration. 3. *Sonorous* and *sibilant* râles, with some large *mucous* râles towards the bases, the latter rarely abundant, and varying in characters according to the consistence of the contents of the tubes. Other signs are generally present in cases of long duration, but they are dependent upon emphysema and other morbid changes accompanying the catarrh.

PROGNOSIS.—When chronic bronchitis is confirmed, only rarely can it be thoroughly cured. The chief dangers are that it will become more extensive or induce emphysema, dilated bronchi, collapse, or phthisis; or that an acute attack might supervene, which is often highly dangerous.

TREATMENT.—From what has just been stated, it is obvious that all cases of chronic bronchitis ought to be thoroughly attended to as early as possible. The patient must be removed from every probable source of irritation and observe due precautions against exposure, wearing warm clothing with flannel next the skin, and if a suitable climate cannot be obtained, it will be well to keep indoors during bad weather, or if obliged to go out to wear a respirator.

It is very important to look to the state of the heart, digestive organs, and general system. If cardiac disease is present, infusion or tincture of digitalis is often very useful. By relieving dyspepsia and keeping

the bowels freely open, much good may also frequently be done. Any constitutional diathesis present must be attended to, especially gout, rheumatism, rickets, and tuberculosis; as well as a plethoric or anæmic state of the blood. A great many cases of chronic bronchitis do well under a course of treatment by tonics and good diet with some stimulant, especially if there is abundant expectoration, causing debility and wasting. Quinine, ferruginous preparations, or mineral acids with bitter infusions, are often very valuable, as well as cod-liver oil. In some cases mineral nervine tonics, such as sulphate or oxide of zinc, are beneficial.

Much discrimination is requisite in the employment of remedies more immediately directed against the local complaint. The main indications are to limit excessive secretion; to assist expectoration if it is difficult; to allay irritable cough; and to subdue spasm of the bronchial muscular fibres. The first indication is carried out by the internal administration of chloride of ammonium; balsams and resins, especially balsam copaibæ, ammoniacum, or galbanum; astringent preparations of iron, acetate of lead, mineral acids, tannic or gallic acid; and by employing inhalations of steam with tar, creasote, carbolic acid, or naphtha; or very dilute dry inhalations of iodine, chlorine, balsamic and resinous vapors, or that of chloride of ammonium. The other indications are fulfilled by the same means as are mentioned under acute bronchitis, and similar precautions must be observed as to the use of narcotics, should there be a tendency to accumulation of secretion. If the sputa are very viscid, alkaline carbonates or liquor potassæ may prove beneficial. Sedative inhalations are most valuable if there is irritable cough. Tincture of Indian hemp is sometimes useful if there is much tendency to spasm.

The chest should be covered in front with some warm plaster and cotton-wool. Free dry cupping, sinapisms, blisters, turpentine liniment, croton-oil liniment, and other local applications are frequently serviceable.

Change of climate or a sea-voyage is most beneficial in many cases. All forms of bronchitis require a tolerably warm region, which is not subject to rapid changes of temperature or exposed to cold winds, and situated at a moderate elevation. Dry catarrh needs a soft and relaxing atmosphere, of moderately high temperature. If there is much expectoration, a dry, warm, and more or less stimulating atmosphere answers best. Torquay, Penzance, Bournemouth, Grange, Clifton, and Tunbridge Wells in this country; and Mentone, San Remo, Pisa, Rome, Cannes, Algiers, and Corfu in foreign countries, are the chief places available for patients suffering from chronic bronchitis.

III. PLASTIC OR CROUPOUS BRONCHITIS.

A few observations must suffice for this rare complaint. Young adults suffer most frequently, and it is rather more common among females. It is supposed to be due to some diathetic condition, and is said to be generally associated with a weak constitution, or sometimes with tuberculosis.

ANATOMICAL CHARACTERS.—A plastic exudation collects in the tubes, forming whitish casts, varying in size according to the tubes affected, as well as in extent; either hollow or solid; and sometimes presenting concentric layers. It consists of an amorphous or fibrillated substance, inclosing granular matter, oil-globules, and cells, some of which are nucleated. Some suppose that it is merely altered blood, the result of bronchial hæmorrhage, but this is not correct.

SYMPTOMS.—Plastic bronchitis is almost always chronic, but presents acute exacerbations. The symptoms are fits of cough and dyspnœa, more or less frequent, severe, and prolonged, being sometimes extremely aggravated; followed and usually relieved by the expectoration of fibrous masses, which on being unravelled under water exhibit tree-like casts of the tubes. There may be some hæmoptysis. Sometimes extensive bronchial catarrh or pneumonia is set up, and considerable pyrexia may be observed. In the intervals patients suffering from this complaint often feel quite well.

The physical signs indicate obstruction of the tubes, more or less complete and extensive, leading to emphysema or collapse. Dry râles are often present, especially of a sibilant character, with a few mucous râles.

A case came under my notice, in which a tolerably healthy-looking young man was affected with plastic bronchitis, bringing up a quantity of casts almost daily, but who scarcely suffered any inconvenience.

TREATMENT.—During the attacks of dyspnœa and cough the use of inhalations; the external application of sinapisms, turpentine fomentations, or blisters to the chest; and the internal administration of sedatives with tartar emetic or ipecacuanha wine might be tried. For the cure of the complaint there is no known remedy. Tonics, cod-liver oil, change to a warm climate, or a long sea-voyage seem to be most beneficial. Tartar emetic, iodide of potassium, alkalies and their carbonates, mercury, inhalations of iodine, and various other remedies have been tried, but usually without success.

IV. DILATATION OF THE BRONCHI—BRONCHIECTASIS.

ETIOLOGY.—Bronchiectasis generally arises in the course of some chronic lung disease, especially bronchitis, phthisis, and chronic interstitial pneumonia. Its immediate causes are supposed to be: 1. Mor-

bid changes in the walls of the bronchi, diminishing their resisting power. 2. Increased pressure of air during cough in parts unsupported; or during inspiration, in consequence of obliteration of a number of air-vesicles, being then compensatory. 3. Persistent pressure of stagnant secretion. 4. Contraction of lung-tissue in connection with chronic pneumonia, the inclosed bronchi becoming dilated in the process.

ANATOMICAL CHARACTERS.—The bronchi may be extensively dilated and of a fusiform shape; or present one or more limited globular enlargements. Their size varies considerably. After a time their inner surface becomes irregular, and occasionally ulcerated; they contain a muco-purulent or purulent substance, often fetid; and gangrene or hæmorrhage sometimes takes place in connection with them. Their contents may ultimately dry up and become caseous or even calcareous; and finally the dilated tubes may become obliterated.

SYMPTOMS.—The only significant symptom of dilated bronchi is the occurrence of severe paroxysms of cough, ending with abundant expectoration, which is discharged with much difficulty, depositing a thick sediment on standing, and being often exceedingly fetid and containing caseous particles.

PHYSICAL SIGNS.—These are indicative of cavities, viz.: 1. Tubular percussion-sound occasionally. 2. Loud bronchial, blowing, tubular, or cavernous breath-sound, which may be heard after a cough when previously absent. 3. Various moist râles, which may be of hollow character. 4. Loud bronchophony or pectoriloquy.

TREATMENT.—The chief point requiring attention is to see that the secretions are not allowed to stagnate in the dilated bronchi. The expectoration may be improved and limited by means of inhalations of carbolic acid or creasote.

CHAPTER VIII.

PULMONARY CONGESTION—ŒDEMA—HÆMORRHAGE.

THESE morbid conditions may be considered together, as they are in many instances but stages of the same process.

ETIOLOGY.—Hyperæmia of the lung may be active, mechanical, or passive. Active congestion results from: 1. Increased cardiac action from any cause. 2. Probable hypertrophy of the right ventricle sometimes. 3. Irritation produced by certain conditions of the air inspired, or by deposits in the lungs. 4. Various pulmonary affections which interfere with the circulation in the capillaries in some parts, in conse-

quence of which those of other parts become overloaded. 5. Inflammatory pulmonary diseases, of which congestion is the first stage, and which it often accompanies. 6. Obstruction to the entrance of air into the lungs during inspiration, and hence rarefaction of the residual air, with diminished pressure on the vessels. The causes of mechanical hyperæmia are: 1. Some cardiac disease in the great majority of cases, interfering with the passage of blood through the left cavities of the heart, especially mitral disease, but probably also a feeble dilated condition of the left ventricle. 2. Very rarely a tumor pressing on the pulmonary veins. Passive congestion is most frequent in low fevers and other conditions which greatly depress the action of the heart and disturb the capillary circulation, especially in the aged and feeble; it is seen chiefly in dependent parts, usually the bases and posterior portions of the lungs, on account of gravitation, and it is then termed "hypostatic." Probably it may also arise in connection with a very weak dilated right ventricle.

Œdema is as a rule the result of long-continued or intense congestion from any cause, but especially when associated with cardiac disease. It may be but a part of a general dropsy.

Hæmorrhage into the lungs may occur under the following circumstances: 1. As a result of congestion. 2. From the lodgment of an embolus in one of the branches of the pulmonary artery. This embolus is usually associated with cardiac disease, and is detached from a clot in the right ventricle, but it may be conveyed from more distant parts. 3. From a diseased condition of the branches of the pulmonary artery; this often materially aids in the causation of pulmonary hæmorrhage. 4. As the consequence of injury to the lungs or chest. 5. From morbid growths, cavities, or ulcers in the lungs. 6. In connection with some morbid condition of the blood, such as that associated with scurvy, purpura, or malignant fevers.

ANATOMICAL CHARACTERS.—Hyperæmia gives rise to a more or less deep-red color, which may become bluish, purple, livid, or blackish-red. The part affected is enlarged, relaxed, and moist; crepitates imperfectly; and a quantity of aerated bloody fluid escapes on section; pieces float in water. In extreme cases the vesicular structure is scarcely apparent, and the tissue breaks down very readily, this condition of the lung being termed splenification. Hypostatic congestion may end in hypostatic pneumonia.

Œdema is necessarily chiefly observed in dependent parts, and is always present, more or less, when the lungs are congested. The lungs are enlarged, tense, do not collapse when the chest is opened, and have a peculiar feel, retaining the impression of the finger for a time. The tissues are very moist, and on section a large quantity of serous fluid escapes, either red or colorless according as it is associated with con-

gestion or not, and it may or may not be frothy. The lungs are either congested or pale.

Hæmorrhage is described as occurring under four forms, viz.: 1. *Circumscribed or nodular; hæmorrhagic infarction or pulmonary apoplexy.* 2. *Diffuse, or true pulmonary hæmorrhage.* 3. *Interlobular.* 4. *Petechial*, in connection with blood-diseases. The last two are very rare, and do not call for further notice.

Hæmorrhagic infarction is due to embolism, and the blood comes from the capillaries of the pulmonary artery, collecting within the alveoli and minute bronchi as well as outside them, but there is no laceration of tissue. The size of an accumulation varies considerably, depending upon that of the branch of artery obstructed, and it may measure from half an inch to four inches or more in diameter. When in the interior it is large; near the surface small and wedge-shaped or pyramidal, with the base projecting outwards a little beyond the surface. The most frequent seats of infarction are the interior of the lower lobes, and about the root of the lung, but at the same time there may be others near the surface, and they are often numerous. The hæmorrhages are circumscribed and defined, and may only correspond to a single lobule, but there is congestion with œdema around. They feel very firm and hard; a section appearing solid, airless, slightly granulated, dark red or blackish, while coagulated blood can often be scraped away, and then lung-structure may be perceptible.

Apoplectic clots in the lungs are liable to the usual changes, and the blood may ultimately be completely removed, the tissues being restored to their normal condition. In many cases a permanent blackish, pigmented knot is left. Pneumonia or abscess is sometimes excited, the clot softening in the centre; or it may undergo caseous or calcareous degeneration and become encapsuled.

In the diffuse form of hæmorrhage a vessel of some size gives way, the lung-tissue being lacerated, and an irregular potential cavity being formed, varying in size, and containing a mixture of fluid and clotted blood. The pleura may give way, the blood then escaping into its cavity.

A few remarks may be made here with reference to a condition known as "brown induration of the lung." This follows long-continued congestion, especially that due to mitral disease, and it is characterized by the accumulation of granular yellowish pigment, probably of the nature of hæmatoidin, in enlarged epithelial and granular cells, which collect in the alveoli; with varicose dilatation of the capillaries; and probably thickening of the alveolar walls. The pigment may become black, and may finally be found free. The lungs are increased in bulk and do not collapse; feel heavy, compact, and inelastic; and present a yellowish tint, passing into brown or reddish-brown. On section, in addition to the general change of color, red spots are seen,

shading into black, and a brownish fluid may be expressed. Various degrees of the change are observed, and the extent of tissue affected differs much, while infarctions are often present at the same time.

SYMPTOMS.—These are not easy to define, as they are usually only exacerbations of previously existing symptoms. One of the most obvious symptoms resulting from pulmonary congestion and its consequences is dyspnœa, either coming on for the first time or being more intense than before, sometimes amounting to orthopnœa. A feeling of tightness or oppression is often experienced across the chest, but pain is generally absent. There is cough, which in œdema is attended with very profuse watery expectoration; and when hæmorrhage exists, more or less blood is usually discharged, which may have a dull-brownish or bistre color, or be almost black. If a clot excites inflammation, there will be pyrexia and other symptoms indicating this complication.

PHYSICAL SIGNS.—1. Movements are often diminished. 2. Percussion-sound is at first abnormally clear in congestion, but afterwards becomes more or less deficient. There may be localized dulness in connection with hæmorrhages. 3. Respiratory sounds are weak and harsh; over the seat of hæmorrhage they may be bronchial. 4. Œdema is characterized by abundant, small, liquid, bubbling râles; localized moist râles may also be perceptible over hæmorrhages, and here signs of pneumonia or abscess may ultimately be set up. 5. Vocal fremitus and resonance may be increased or diminished, but are quite unreliable.

PROGNOSIS.—As a rule these affections are serious, and they increase the gravity of the prognosis considerably when they complicate other dangerous conditions.

TREATMENT.—Much will depend on the exact nature and extent of the morbid changes, and the conditions which cause them or with which they are associated. Free dry cupping of the chest is often very useful, and sometimes local removal of blood is indicated. It is important to attend to position, and to keep the patient at rest. Good diet, tonics, and stimulants are frequently necessary. Care must be taken in œdema that the fluid is not allowed to accumulate in the lungs. In diffuse hæmorrhage astringents are required. Remedies which act upon the heart and vessels may be of much service.

CHAPTER IX.

PNEUMONIA—INFLAMMATION OF THE LUNGS.

INFLAMMATION of the tissues of the lungs occurs under different forms, each of which requires separate consideration.

I. ACUTE CROUPOUS PNEUMONIA—LOBAR PNEUMONIA.

ETIOLOGY.—*Predisposing causes.* 1. Age. Most cases occur between 20 and 30, but no age is exempt, and the young and old are very liable to suffer. 2. Sex. More males are attacked, probably from greater exposure to the exciting causes. 3. Social position, habits, and occupation. Poverty, residence in large towns, intemperance, and occupations involving exposure or over-exertion, predispose to pneumonia. 4. State of health. Pneumonia is very liable to occur in those who are constitutionally feeble, or who suffer from any lowering chronic or acute disease; as well as during convalescence from the latter. 5. Previous attacks increase the liability. 6. Climate and season. Those characterized by coldness, rapid changes in temperature, much moisture, or the prevalence of northerly and easterly winds, greatly predispose to attacks of pneumonia.

Exciting causes. 1. Most cases of *primary* pneumonia arise from a sudden chill when the body is heated; exposure to cold or wet; or a cold draught. 2. Direct irritation not unfrequently sets up pneumonia, which may be due to the inhalation of very hot or cold air, or irritating gases; foreign bodies, such as food; blood, especially apoplectic clots; or morbid deposits, *e. g.*, tubercle, cancer, diphtheritic or croupous exudation. 3. Injury to the chest often excites local inflammation, such as contusion, fracture of the ribs, or perforating wounds. Some are of opinion that violent exertion is occasionally a cause, but this is very doubtful. 4. Pneumonia is frequently *secondary* to various acute affections, especially low fevers and blood-diseases, *e. g.*, measles, small-pox, typhus, typhoid, pyæmia, puerperal fever. It is also very apt to arise in chronic blood-diseases, but in these cases there is some other exciting cause, which may be undiscoverable, acting on a depraved system. 5. Epidemic pneumonia has been described. The complaint may assume this character in connection with influenza or other epidemic diseases, especially if there is much overcrowding with deficient ventilation. It is also said to prevail in malarial districts. 6. Intense or long-continued pulmonary congestion is very liable to cause pneumonia, especially in connection with heart-disease, or the “*hypostatic congestion*” which affects dependent parts in old and weak individuals who are confined to bed from any cause—*hypostatic pneumonia*.

Some authorities regard primary pneumonia as a “*specific fever*” of which the lung inflammation is but a local manifestation.

ANATOMICAL CHARACTERS.—Pneumonia is characterized pathologically by hyperæmia and œdema, followed by the formation of a fibrinous exudation in the interior of the air-vesicles and minute bronchi, which undergoes various changes. It is necessary to describe the appearances presented in different stages.

Dr. Stokes has described a *preliminary stage*, characterized by bril-

liant arterial redness, with abnormal dryness, but no other alterations. Those usually seen, however, are as follows:

First or engorgement stage. External characters. Color is dark-red, reddish-brown, violet, or livid; not uniform, but mottled. The lung feels heavy, and the affected part is firmer, more resisting, and less elastic than in health, retaining impressions of the finger, and not crepitating much. On section a quantity of reddish or brown bloody serum escapes, more or less aerated, and somewhat viscid. The lung-texture is still perceptible, and pieces float in water. Consistence is diminished, the tissue being more easily torn.

Second or exudation stage—Red hepatization. External characters. Color is more uniform and dull-reddish. Weight is markedly increased, and the lung is sometimes evidently distended, being marked by the ribs. The tissue feels solid and firm, absolutely inelastic, and non-crepitant. A section is of a dull reddish-brown color, with some grayish variegation, and opaque, but it becomes brighter after exposure. Very little fluid escapes, often none except on pressure, this being thick, dirty, sanguineous, and non-aerated. A characteristic granular appearance is usually visible, especially on tearing the affected part, but it is less marked in children, or when the exudation is soft, as in low fevers and when the disease attacks old people. All trace of lung-texture has disappeared, and its tissue is very brittle, breaking down easily under pressure. Fragments sink in water instantly. The microscope reveals amorphous fibrin, with abundant newly-formed cells and some granules.

Third or gray hepatization stage. In this stage the color gradually fades, becoming ultimately gray, with a greenish or yellowish tint; the granular appearance on section is less distinct or lost, and the lung-tissue becomes more or less soft or pulpy. A quantity of dirty, grayish, almost puriform fluid escapes, either spontaneously or on pressure or scraping. This stage presents all grades, from slight softening to what is termed "purulent infiltration." There is excessive cell-formation, with fatty degeneration and liquefaction of the inflammatory products. In favorable cases these materials are ultimately either absorbed or expectorated, and the lung-tissue remains unaltered in structure.

Such being the ordinary course of a case of pneumonia, other *pathological terminations* are observed in rare instances, viz.: 1. Formation of one or more abscesses, which may open into the bronchi and be discharged, leaving a cavity; or into the pleura; or become encapsuled, the contents undergoing cheesy or calcareous changes, and complete closure may ultimately take place. 2. Gangrene. 3. Caseous degeneration. 4. Chronic induration or cirrhosis.

The *right lower lobe* is the most frequent seat of acute pneumonia, but the inflammation may spread through the entire lung, or involve

both organs. Sometimes it begins in the middle or upper lobe, and in the old or cachectic it often extends from above downwards.

The parts of the lungs not pneumonic are frequently congested and oedematous, while more or less bronchitis is present. Pleuritic exudation is commonly observed, but not often abundant effusion. The right cavities of the heart and venous system are overloaded, the various organs being congested, and fibrinous coagula are liable to form in the heart and vesicles, the blood being exceedingly rich in fibrin, exhibiting the "buffy" coat markedly.

SYMPTOMS.—In some cases an attack of pneumonia is preceded for a short time by premonitory signs, indicating general indisposition. Primary pneumonia usually sets in very suddenly, the invasion being attended with a single, severe, more or less prolonged rigor. There may be great prostration, with pyrexia; vomiting; or nervous symptoms, viz., headache, delirium, restlessness, stupor, or, in children, convulsions. The special symptoms are *local* and *general*.

Local. Pain in the side is usually complained of, being occasionally simultaneous with the rigor or even preceding it, but as a rule setting in after a variable interval. Its seat is generally about the mammary region, and though considerable it is not very intense, at all events for a long period, being tolerably easily relieved. In character it is commonly stabbing or piercing, being increased by a deep breath and cough. Tenderness is often observed, and sometimes hyperæsthesia of the skin. Dyspnœa is an early and prominent symptom, as evidenced by the sensations of the patient; the rapidity of the breathing, which, however, is abrupt and shallow; by the working of the nostrils; and difficulty of speech. The pulse-respiration ratio is greatly disturbed, the respirations ranging from 30 to 60, or occasionally even reaching 80. Occasionally orthopnœa exists. Cough also commences very soon. It does not come on in violent paroxysms, but is short and hacking, often spasmodic and difficult to repress, especially when the patient is made to breathe deeply or to sit up, while the act causes much distress. Expectoration speedily ensues, the sputa presenting peculiar characters. They are scarcely at all frothy, but exceedingly viscid and adhesive, so that they are discharged only with much difficulty, have to be wiped from the mouth, and often do not fall out when the vessel which receives them is overturned. They have a "rusty" color, or present various tints of red, owing to admixture of blood, but as the disease progresses changes of color are observed, through different shades of yellow, until finally they become merely bronchitic. The microscope reveals epithelium; blood-disks; so-called granular- or exudation-cells; sometimes minute ramifying coagula, which may be evident to the naked eye as small structureless masses in the sputa; and at last pigment-cells or free pigment; abundant granules and oil-globules; free nuclei; or occasionally pus-cells. Chemical examination yields mucin; albumen; often a little

sugar; salts, especially chlorides; and, it is said, occasionally a special acid. The expired air may be cool, and is deficient in carbonic anhydride.

Such being the ordinary local symptoms of acute pneumonia, it must be borne in mind that very considerable deviations may be noticed, due to the patient being very young or old, or feeble; to the portion and extent of lung-tissue affected; the type and course of the pneumonia; or to the disease being secondary. It is impossible to point out here the modifications met with, but it may be mentioned that pain and other symptoms are sometimes very slight or absent—*latent pneumonia*; and that the sputa may be absent or merely bronchitic; or in low cases may present the appearance of a dark, offensive, thin fluid, resembling licorice or prune-juice. Occasionally they are tinged with bile.

General. These may be summed up in general terms as high pyrexia, with great depression and prostration.

The skin soon becomes exceedingly hot and dry, having a burning, acrid feel. Sometimes perspiration takes place, but there is no relief. The temperature rises with great rapidity to 102°, 103°, 105°, or even higher. The maximum is generally reached on the second or third day, but the temperature may continue to ascend until near the termination of the case. It has been known to rise to 107° in cases which have recovered, and in fatal cases has attained 109.4°. In a large number of instances the temperature does not go beyond 103° or 104°. The daily variations are usually as follows. The temperature is lowest in early morning, and begins to rise in the forenoon or soon after, attaining its maximum early in the evening. It then falls, but in some cases a slight rise is again observed at midnight, after which a gradual fall takes place. The remission ranges from $\frac{2}{3}$ ° to 2.5°, but is seldom more than 1.8°. Usually it ceases altogether a day or two before the crisis. In rare instances, when pneumonia is associated with intermittent fever, the temperature becomes quite normal in the mornings—*intermittent pneumonia*. An extension of inflammation or a relapse will disturb its normal course. There is usually considerable flushing of the cheeks, which may be more marked on the pneumonic side; sometimes a tendency to duskiness or lividity is noticed, or the face may present a yellowish, earthy tint. The expression is either painful and anxious, or heavy and stupid. Herpes is frequently observed on the face about the second or third day.

The pulse is usually frequent, being as a rule proportionate to the extent of the pneumonia. It ranges generally from 90 to 120, but may be much above this. At first strong, full, and incompressible, it subsequently becomes weak, small, and yielding, sometimes intermittent or irregular. The sphygmograph affords useful indications as to its characters.

A prominent symptom in most instances is the great and evident prostration and feebleness of the patient. The position assumed is generally on the back with the head rather high, and it is often only with difficulty that the patient can be made to sit up.

The digestive organs present to a marked degree the ordinary symptoms associated with pyrexia. The tongue tends to be dry, and the lips to crack. As occasional and usually unfavorable symptoms there may be dysphagia, severe vomiting, jaundice with enlarged liver, or diarrhœa. The ordinary cerebral symptoms are headache, sleeplessness, and restlessness, often with slight nocturnal delirium. The urine, in addition to being highly febrile, frequently contains a little albumen, and chlorides are very deficient or entirely absent.

In some cases the symptoms assume an adynamic character, indicated by a dry brown tongue, with sordes; and low nervous phenomena, such as delirium, stupor, coma, convulsions, twitchings and tremors, and affections of the senses—*typhoid pneumonia*. This is especially apt to occur if the patient is old, very weak, or intemperate; if the disease is secondary to certain acute and chronic diseases, or attended with high pyrexia; or if it goes on to suppuration or gangrene, which causes extreme prostration. In drunkards the symptoms at first often resemble those of delirium tremens, followed by collapse. Occasionally they simulate those of mania or cerebral inflammation. The formation of pus is usually attended with severe rigors and increase of pyrexia. If it collects in an abscess, it may be suddenly discharged along with fragments of lung-tissue.

Sometimes distinct signs of cyanosis set in, with distension of the right side of the heart and venous system, and formation of coagula in the pulmonary vessels.

PHYSICAL SIGNS.—I. *Stokes's stage*. At this time the only sign is a harshness and roughness of the breath-sounds, these being usually exaggerated. I have had several opportunities of verifying that this stage is a reality.

II. *Engorgement stage*. 1. Respiratory movements are deficient partly on account of pain. 2. Vocal fremitus is often increased. 3. Percussion-sound is usually not much altered, but may be abnormally clear, or slightly deficient in resonance. 4. Respiratory sounds are harsh and weak, or occasionally somewhat bronchial. 5. The principal physical sign is the *true crepitant rhonchus*, which is heard over the affected portion of lung.

III. *Red hepatization stage*. 1. There may be slight enlargement of the side. 2. Movements are greatly impaired, especially expansion. 3. Vocal fremitus is in excess. 4. Percussion as a rule reveals dulness with increased resistance; sometimes the percussion-note is rather hollow, and of tubular or even amphoric quality. In *bacillary pneumonia* a tubular or tympanitic note can sometimes be elicited over the front of

the upper part of the chest. 5. The respiratory sounds afford one of the most important signs. Frequently they are typically tubular, dry, high-pitched, whiffing or metallic; sometimes merely blowing or bronchial. 6. Crepitant rhonchus is often heard at the confines of the inflamed part. 7. Vocal or cry resonance is intensified, high-pitched, sniffling, and metallic. It may be almost œgophonic or pectoriloquous; and occasionally whispering pectoriloquy is observed. 8. There is no displacement of organs. The heart-sounds are frequently intensified over the affected part.

IV. *Resolution stage.* The chief additional physical signs at this stage are *redux crepitant rhonchus*; or thin bubbling râles, either large or small, of ringing or metallic character. The other abnormal signs usually disappear, sometimes with great rapidity, in other cases only slowly and gradually; sometimes they remain. The dulness may subside in patches. Occasionally slight retraction of the chest follows an attack of pneumonia.

The signs just described are commonly observed at one or both bases. Variations may be met with, due to the consolidation becoming extreme, the tubes being completely blocked up; to the inflamed part lying deep in the lung; or to other unusual conditions. Diffuse sup-puration gives rise to abundant, liquid, bubbling râles. An abscess or gangrene is followed by the signs of a cavity. The signs of bronchitis and pleurisy are often present. In the unaffected parts respiration is exaggerated.

TERMINATIONS AND DURATION.—1. In the majority of cases pneumonia ends in complete recovery by resolution. Usually a marked crisis takes place, the temperature falling rapidly to or even below the normal, while the pulse and respirations also diminish in frequency, and the other symptoms speedily abate, convalescence being soon established. This happens usually from the third to the eleventh day, being most frequent about the end of the first week, but not necessarily on odd days, as some suppose. The crisis is attended with profuse perspiration; an abundant discharge of urine, which deposits lithates, oxalates, and phosphates, or sometimes contains blood; or occasionally with diarrhœa, epistaxis, and other hæmorrhages, or the development of a skin eruption. It may be followed by considerable and even fatal collapse. In some cases defervescence takes place by lysis, convalescence being protracted. Slow recovery may ensue even after gangrene or abscess. A relapse sometimes happens. 2. Death may occur either from asphyxia, or more commonly from collapse and exhaustion. This may take place even after the crisis. 3. Now and then transition into chronic pneumonia is observed, the exudation remaining unabsorbed, and the symptoms continuing, with irregular fever and loss of flesh. Ultimately a form of phthisis is sometimes set up.

DIAGNOSIS.—This subject will be again considered under the general

diagnosis of acute lung-affections. At present it is only needful to call attention to the fact that pneumonia often comes on insidiously, and, whenever this is probable, the chest should be frequently examined. It may also simulate low fevers, cerebral inflammations, or acute alcoholism.

PROGNOSIS.—Different observers have given very conflicting statements as to the rate of mortality in pneumonia, but it must always be looked upon as a serious affection. The chief circumstances which increase the danger are: very early or advanced age; the female sex; pregnancy; debility from any cause; previous intemperance; the presence of chronic pulmonary, cardiac, or renal disease; extensive adhesions of the pleura or pericardium; the disease being secondary; both lungs being involved, or the whole of one, or its central or upper part; the sputa being very abundant and watery, or like prune-juice, or absent with signs of accumulation in the lungs; the termination in diffuse suppuration, abscess, or gangrene; the development of typhoid and low nervous symptoms, or those indicating marked collapse; signs of apnœa; the existence of serious complications, such as gastro-enteric catarrh or pericarditis; a low epidemic type.

TREATMENT.—Of course it is highly important in treating pneumonia to observe all the precautions demanded in the management of lung diseases in general, but the sick-room must be well ventilated. Three main plans of treatment have been adopted in the management of this disease, viz.: 1. *Expectant*. 2. *Antiphlogistic*. 3. *Stimulant*. However, no uniform method ought to be followed, but it is essential that each case should be carefully considered in all its details, and the treatment modified accordingly.

1. The *expectant* plan, in which the patient is merely protected against injurious influences, and properly fed, while symptoms are relieved, the cure of the disease being left to nature, is one which unquestionably may be carried out with advantage in many instances; but to apply it to all cases indiscriminately is most injudicious.

2. In the *antiphlogistic* treatment, the chief remedies employed are venesection or local removal of blood; tartar emetic; calomel and opium; digitalis, aconite, or veratria. It has been satisfactorily proved that venesection is rarely required, cases in which it might be indicated doing just as well without it, and in a great many instances it would be most injurious. It may relieve dyspnœa and diminish fever, but only temporarily. Moderate bleeding is occasionally requisite, in order to avert death from apnœa. Local bleeding cannot subdue the inflammation, but it is useful sometimes in mitigating symptoms. Tartar emetic is decidedly a serviceable drug when the patient is strong and plethoric. It should not be given in large doses; from gr. $\frac{1}{4}$ to $\frac{3}{4}$ every four hours being quite sufficient for an adult, and it may be combined with com-

pound tincture of camphor and hydrocyanic acid. Of the use in this disease of the other drugs mentioned I have no experience.

3. Many practitioners have recourse to the *stimulant* treatment, giving large quantities of alcohol, in the form of wine or brandy, with ammonia, chloric ether, camphor, and similar remedies. The routine employment of these remedies, however, is to be equally deprecated with those of the opposite class, for they are often unnecessary, and may do more harm than good. In many instances they are most valuable, the quantity to be given depending upon the nature of the case, and their usefulness or the reverse being judged of by the effects produced. It is a good rule if in doubt to try them carefully. The main indications for stimulants are delirium, if not associated with vascular excitement; a very rapid, weak, or dicrotic pulse; any signs of adynamia or collapse, with low nervous symptoms; the patient being old or feeble; and the inflammation being secondary. In all low forms of the disease the only chance of recovery lies in free stimulation, a pint or more of brandy being often required in the twenty-four hours, and if necessary there ought to be no hesitation about giving this quantity. At the same time full doses of carbonate of ammonia with decoction of bark, spirits of chloroform, ether, camphor, musk, and such remedies, must be administered. In some cases quinine with iron is useful, and in very adynamic conditions oil of turpentine has been recommended, which may be introduced by enema. In most instances it is advisable to give a little wine or brandy after the crisis, as there is often much exhaustion at this time.

Attention to diet is of considerable moment. In all cases a good quantity of beef tea and milk should be administered at regular intervals, and abundant support is often needed. Cooling drinks are useful, or some saline drink may be freely allowed.

Local treatment. The application of cold to the chest has been advocated, either by means of wet compresses frequently changed, or ice-bags covered with muslin. Great caution must be exercised in their employment. Hot fomentations or poultices, either alone or with anodynes; turpentine fomentations; or sinapisms are useful for the relief of pain. Blisters are only needed in the advanced stages as a rule, and not even then if absorption is going on satisfactorily.

Opiates are frequently required to relieve pain, procure sleep, and alleviate distressing cough. They must be given with due caution. Hypodermic injection of morphia is often most valuable. Hydrate of chloral is a useful substitute in many cases, as well as other sedatives and narcotics. If there is high pyrexia full doses of quinine may be tried, but it might be requisite to have recourse to baths. Should expectoration be very difficult, on account of excessive viscosity of the sputa, alkalies are recommended. Chloride of ammonium with squill and de-

coction of senega are useful in such cases, especially during the latter stages.

Every care is necessary during convalescence, and the patient should be kept under observation until thoroughly convalescent. Tonics are serviceable at this time with good diet, and cod-liver oil in some cases.

II. CATARRHAL PNEUMONIA—DISSEMINATED OR LOBULAR PNEUMONIA—BRONCHO-PNEUMONIA.

ETIOLOGY.—This variety of lung inflammation may assume an acute or chronic form, and in the great majority of cases it arises in the course of bronchitis, being either the result of direct extension of inflammation along the minute bronchi to the air-vesicles; or more commonly being set up in collapsed lobules. Acute catarrhal pneumonia is by far most common among children, being particularly observed in connection with whooping-cough, measles, diphtheria, and influenza, but it may arise independently of these affections. It is predisposed to by debility; inhalation of impure air; and a long-continued recumbent posture. There is reason to believe that the pneumonia occurring in the aged and feeble, and in those dying from acute or chronic diseases, is not unfrequently of this nature. As a more or less chronic affection, resulting from gradual extension of bronchial catarrh into the alveoli, catarrhal pneumonia is now looked upon by many pathologists as originating a large proportion of cases of phthisis. It may be produced in connection with dilated bronchi.

PATHOLOGY AND ANATOMICAL CHARACTERS.—There is no fibrinous exudation, such as is characteristic of croupous pneumonia, but merely a proliferation of the cells lining the alveoli, which become so abundant as to fill and distend the latter. In favorable cases the cells undergo liquefaction, and are absorbed or discharged. Sometimes abscesses are formed; or cheesy degeneration ensues, ultimately leading to destruction of the lung-tissue or tuberculosis. Chronic interstitial pneumonia may be set up. When following collapse, the morbid appearances are usually confined to isolated lobules, but by their coalescence large tracts of lung-tissue may be involved, especially at the bases and along the posterior borders. Generally they are mingled with signs of bronchitis; congestion with œdema; or merely collapsed lobules. The inflamed lobules are disseminated irregularly through both lungs, being most abundant towards the bases, along the lower free border, and at the surface. They vary in size considerably, and when superficial have a pyramidal or wedge-like form, with the base outwards, projecting somewhat beyond the surface. They feel like firm, solid knots, but are in reality friable, breaking down readily under pressure. A section presents a more or less grayish-yellow color, gradually fading into sur-

rounding congestion, with generally a granular aspect. A whitish, opaque, non-frothy fluid can be scraped or pressed from the surface, containing abundant cells, many of which resemble under the microscope pus- and mucus-corpuscles. Within the lobules there are often small dilated bronchi, containing a purulent fluid. The affected parts sink instantly in water. The appearances just described are those met with when the inflammatory process is well established, but gradual transitions are observed from merely collapsed lobules.

When the inflammation is independent of collapse, very numerous, small, ill-defined, whitish-yellow spots are seen scattered through congested and œdematous lung-tissue, only slightly granular, and yielding an opaque milky fluid on pressure. In some parts little cavities form, containing a pus-like matter, but many are of opinion that this has gravitated into the minute bronchi or air-vesicles, or has been drawn in during inspiration.

SYMPTOMS.—Usually occurring in the course of other complaints, especially bronchitis, the symptoms of acute catarrhal pneumonia may set in very speedily, as in measles, or gradually, as in whooping-cough, but they are generally modifications of those previously existing. Very rarely is the onset indicated by any rigors or other marked premonitory symptoms, such as are observed in ordinary pneumonia. Pyrexia is a most important sign, the temperature rising often to 103°, 104°, or 105°; the remissions, however, are considerable, and irregular as to time, while renewed exacerbations are liable to occur after the temperature has become normal. The skin often perspires freely, and is not pungent to the feel. The pulse increases in frequency, but soon tends to become feeble and irregular. The chest symptoms when the complaint follows bronchitis are increased dyspnoea, the respirations being exceedingly frequent; a change in the characters of the cough, which often becomes short, harsh, hacking, and painful, the child endeavoring to repress it, and presenting an expression of pain, or crying; and diminished expectoration, the sputa being scarcely ever “rusty.” Physical signs are exceedingly uncertain and ill defined. In the parts corresponding to the consolidated portions there may be increased vocal fremitus; dulness; bronchial breathing; small, scattered, sometimes ringing râles; and bronchophony.

The course of the disease may be exceedingly acute and rapid; or subacute. In the former class of cases there is generally great restlessness and anxiety; or the patient may soon fall into a stupid and apathetic state. Signs of cyanosis are common. Loss of strength and emaciation are prominent characters, the latter being especially marked in the less rapid cases. The subsidence of the disease in cases of recovery is usually very gradual and protracted, there being no crisis, but an irregular defervescence by lysis. As already mentioned, catarrhal pneumonia may lead to permanent lung mischief.

TREATMENT.—All lowering measures are decidedly injurious. Ipecacuanha wine is useful, with salines; or ammonia and senega, if there is much debility. Abundant nourishment is required, with alcoholic stimulants in many cases. Emetics are sometimes serviceable to aid in unloading the lungs. The continued application of cold compresses to the chest has been strongly recommended. Sinapisms are often necessary. Great care is required during convalescence, and tonics, cod-liver oil, good diet, with wine, are indicated.

III. CHRONIC OR INTERSTITIAL PNEUMONIA—CIRRHOSIS OF LUNG—FIBROID PHTHISIS—FIBROID DEGENERATION—INDURATION WITH DILATED BRONCHI.

ETIOLOGY AND PATHOLOGY.—The forms of pneumonia already described may become more or less chronic, but the condition now under consideration is one in which the lung becomes greatly contracted and indurated, pigmented, the air-vesicles being obliterated, and the bronchial tubes usually dilated. These changes are generally considered as partly due to proliferation of the interlobular and subpleural connective tissue; and partly to the formation of a nuclear growth, which develops into extensive tracts of fibroid tissue; but some regard them as the result of a chronic inflammatory process; or of a fibroid change affecting the walls of the alveoli themselves. There can be no doubt but that in the great majority of cases this disease is secondary to some previous pulmonary affection, being the consequence of long-continued irritation. The conditions of which it may thus be a sequel are: 1. Acute croupous pneumonia very rarely. 2. Catarrhal pneumonia frequently. 3. Dilatation of the bronchi, though Dr. Wilson Fox thinks that the fibroid change is then preceded by catarrhal pneumonia. 4. Collapse or compression of the lung. 5. Pleurisy, but it is doubtful whether the change can then extend to any depth, unless pneumonia precedes it. 6. Bronchial irritation from inhalation of mineral and other particles, such as steel, coal or stone dust, cotton. 7. Various deposits, such as tubercle or cancer; phthisical cavities; pulmonary hæmorrhage or abscess; or injury. In these conditions the morbid process is localized, and may really be a method of cure.

Some pathologists, however, consider that interstitial pneumonia is in some instances essentially *primary*, being, as some think, the result of a chronic inflammatory process in the interstitial tissues resembling that which takes place in cirrhosis of the liver; or, as others believe, a direct, idiopathic, fibroid change, degeneration, or substitution in the walls of the alveoli, not associated with inflammation, which process tends to spread through the lung. No cases bearing out this view have ever come under my notice.

It is necessary to allude to the relation of dilated bronchi to chronic pneumonia. Doubtless in many cases this dilatation is secondary to the induration; but there is every reason to believe that the former is sometimes the original morbid condition, and gives rise to the fibroid change.

ANATOMICAL CHARACTERS.—In the early stage of chronic pneumonia, the tissue is congested, but it afterwards becomes paler, and may exhibit extensive tracts of a homogeneous-looking nucleated substance. When the process is advanced, the appearances are very characteristic. The lung is contracted and shrunken; its tissue is hard and dense, cannot be torn, and creaks on being cut. A section is smooth and dry, pigmented, often presenting a marbled gray aspect, while fibrous bands or masses may be seen traversing the section, some of the former being probably obliterated and thickened bronchi or bloodvessels. The vesicular tissue is destroyed, but many of the bronchi are usually dilated. The fibrous growths may ultimately become caseous.

The extent of lung involved varies considerably. The change may be limited at first to the bronchi and the tissue immediately around; or it may only be visible around deposits or cavities. A peculiar feature of this disease is, that it is usually limited to one lung, which it may affect throughout, or be confined to its base, apex, or middle part.

The pleura is usually thickened, sometimes extremely so, and adherent. Emphysema is common in unaffected parts of the lungs, and other morbid conditions are frequently seen with which the chronic pneumonia is associated as a sequel.

SYMPTOMS.—Interstitial pneumonia runs a very chronic course, and its symptoms at first are not definite, but when it is fully established it may present well-marked clinical characters. The local symptoms are dragging pains about the sides; shortness of breath; and cough, which is often irritable, difficult, and ineffectual; or comes on in fits, attended with the expectoration characteristic of dilated bronchi. The complaint is often attended with general symptoms, viz., very gradual loss of flesh and strength; anæmia; sometimes night-sweats; but pyrexia is absent as a rule, or it is but slight. After a time signs of obstructed circulation may set in.

PHYSICAL SIGNS.—These indicate dense consolidation and contraction of lung; often with cavities due to enlarged bronchi. 1. The whole side is retracted, often extremely. 2. Movement is deficient or absent. 3. Vocal fremitus may be increased or diminished. 4. Percussion gives a hard, wooden, high-pitched sound, with marked resistance. Occasionally the sound is tubular in some parts. 5. Respiration-sounds differ in different parts, being weak or absent, bronchial, tubular, or cavernous. After a cough they are often heard where previously absent. 6. Various râles may be heard in the dilated bronchi. 7. Vocal resonance is variable, being deficient, bronchophonic, or pectorilo-

surfaces of this membrane. Subsequently in very exceptional cases a fibrous capsule may be developed, the sphacelated portion is expelled, and a cavity secreting healthy pus remains, which ultimately may close up and cicatrize.

The diffuse form does not present any line of demarcation, but runs into or is mixed up with congested, inflamed, or œdematous lung-tissue. A whole lobe or the greater part of a lung may be implicated, being softened sometimes to pulpiness, greenish or brownish-black or black, more or less saturated with a dirty grayish-black liquid, and, in short, in the condition of a moist, stinking, putrid slough.

SYMPTOMS.—The only two symptoms which are characteristic of gangrene of the lung are extremely fetid breath; and the expectoration of gangrenous matters with fragments of lung-tissue. The former may precede the latter symptom for some days, and it is sometimes only observed at intervals. It must be remembered, however, that the breath may be very foul in some cases of chronic bronchitis. The sputa subsequently become foul, frothy, partly liquid, partly muco-purulent, often dirty, brownish, or blackish, containing gangrenous particles and occasionally fat-crystals, while elastic fibres may be detected in some cases. More or less blood is often present, and death may result from hæmorrhage. On standing the sputa separate into layers, and a thick sediment falls. The general symptoms in most cases are those of extreme depression, adynamia, and collapse, with low nervous phenomena, ending in speedy death. If the gangrenous materials are swallowed, severe diarrhœa with tympanitis is liable to set in. Emboli may be carried from the lung and originate septicæmic abscesses elsewhere. Occasionally death takes place by a slow process of hectic; or very rarely recovery may ensue.

PHYSICAL SIGNS.—At first these are merely indistinct breathing, with moist râles; followed, if the gangrene is circumscribed, by more or less marked signs of a cavity containing thin fluid. Extensive bronchitis or pleurisy is often set up.

PROGNOSIS is necessarily exceedingly grave.

TREATMENT.—The measures to be adopted are to administer abundant nourishment and large quantities of alcoholic stimulants, with ammonia and bark, ether, camphor, mineral acids, or quinine; to use frequent inhalations of creasote, carbolic acid, tar-vapor, or turpentine; to encourage expectoration in every way; and to let the patient gargle freely with some antiseptic, especially Condry's fluid, and drink a solution of chlorate of potash or yeast. Various antiseptics have been recommended internally, such as carbolic acid or sulphocarbonates, sulphites, and hypochlorites. Should the disease become chronic, as well as during convalescence, tonics are needed, with cod-liver oil, change of air, nutritious diet, and other measures for improving the general health.

CHAPTER XI.

EMPHYSEMA OF THE LUNGS.

Two primary forms of this affection are met with, named respectively **VESICULAR** and **INTERLOBULAR**. *Vesicular emphysema* is characterized by enlargement of the air-vesicles, either from excessive distension, destruction of their septa, or from both causes combined. *Interlobular emphysema* signifies the presence of air in the subpleural and interlobular cellular tissue, usually the result of rupture of vesicles.

I. **VESICULAR EMPHYSEMA.**

ETIOLOGY AND PATHOLOGY.—Within the definition of this morbid condition as above given, cases are comprised which differ considerably in their clinical aspects and importance. They may, however, be arranged in four groups, though these are frequently more or less conjoined, viz.: 1. Acute emphysema, either general or local. 2. Chronic hypertrophous, or “large-lunged.” 3. Chronic limited. 4. Atrophous, or “small-lunged.” It will be convenient to consider first their etiology as a whole, and then to indicate whatever specially applies to each individual form.

Immediate, Direct, or Determining Causes. 1. *Inspiratory Theory.*—According to this view, emphysema is the result of excessive or long-continued distension of the air-vesicles during inspiration. Thus it is supposed that general emphysema may arise as a consequence of diminished expiratory force, such as that which accompanies the loss of elasticity in the lungs and chest-walls in old age, the inspiratory force remaining unimpaired. Hence the lungs are kept constantly distended, and they are more apt to become so if inspiration is performed vigorously. Again, when portions of the lungs are from any cause, such as pleuritic adhesions, collapse, or consolidation, rendered partially or entirely incapable of expansion, should the chest still enlarge to the usual extent during inspiration, the air which ought to enter these unused portions passes into other parts and stretches their vesicles unduly. This is named *vicarious emphysema*. Dr. C. J. B. Williams believes that in this way emphysema is originated in bronchitis, the secretions or thickened mucous membrane obstructing some of the bronchi, and preventing the air from entering the corresponding vesicles, while those which are adjacent, where the tubes are free, receive an excessive amount of air. On the other hand, Laennec's view was that the vesi-

cles terminating the obstructed bronchi become themselves dilated, in consequence of air entering during inspiration, which cannot be forced out during expiration; hence the emphysema was termed *substantive*. It has been argued against this theory that expiration is a more powerful act than inspiration; to which it is replied that a forced expiratory effort has very little influence in emptying the air-vesicles, especially if the smaller tubes are obstructed.

2. *Expiratory Theory*.—Sir William Jenner strongly advocates the theory that emphysema is commonly the result of violent expiratory efforts with partial closure of the glottis, such as are carried on during coughing, lifting heavy weights, playing wind instruments, and other actions. There are certain parts of the lungs which are much less supported and compressed by the chest-walls and surrounding structures than others, and hence they yield under the above circumstances and become distended. This is especially true with regard to the apices, the anterior margins, and the edges of the bases, especially the left. The tendency to the development of emphysema in this way is greater in proportion to the extent to which the lung is inflated; to the obstruction to the escape of air; to the force which is exercised in its attempted expulsion; and to the want of compression and support of the lung-tissue.

Niemeyer does not seem to lay much stress on the want of support in leading to emphysema from forcible expiration, but rather on the direction of the force. He says: "In all these acts (*i. e.*, coughing, straining, etc.) contraction of the chest is effected by vigorous upheaval of the diaphragm. The result is the expulsion of a strong current of air from the lower bronchi, the direction of which is obliquely upward, and, if the air be prevented from escaping through the larynx, a portion of it, in a compressed state, must be driven into the upper bronchi, whose direction is obliquely downward. By the centrifugal pressure exerted, by the air thus compressed, upon the vesicles of the upper lobes of the lung, and upon the adjacent thoracic wall, the latter become distended as far as it is possible for them to yield."

3. Some pathologists are of opinion that emphysema is due to primary nutritive derangement of the walls of the air-vesicles. Villemain describes a "hypertrophy of the elements of the vesicular membrane, causing an extension of this, and an increase in the capacity of the vesicles." As a secondary result of emphysema, nutritive changes in the walls of the vesicles are constantly seen; and should these be impaired in their resisting power, they are far more liable to become distended by any force acting upon their interior. Hence in old persons one attack of winter cough will often set up a considerable amount of emphysema, and when chronic bronchitis or congestion has existed for a length of time, the resulting alterations in structure render the vesicles much more capable of distension. Atrophous emphysema is the

consequence of primary degeneration, the partitions wasting and disappearing, several vesicles being thus thrown into one; but in other forms of the complaint degenerative changes must probably be rather looked upon as predisposing or "permanence-securing" causes of emphysema, as Sir W. Jenner terms them, than as actual determining causes. What these morbid changes are will be considered under the anatomical characters.

4. Another theory, that of Freund, is that in some cases there is a primary chronic enlargement of the chest, in consequence of hypertrophy and rigidity of the cartilages, and that the lungs become distended and emphysematous in order to fill up the increased space. This must be a very exceptional cause.

No exclusive theory as to the mode of production of emphysema can apply to all cases; and in many doubtless more than one of the causes mentioned has been at work.

Exciting Causes.—1. Emphysema is liable to arise in the course of many pulmonary affections, viz., bronchitis, especially chronic dry catarrh; consolidation or destruction of portions of the lung from any cause; collapse; extensive pleuritic adhesions or effusion. 2. Hooping cough is a common cause in children. 3. Croup and other affections obstructing the main windpipe and exciting much cough at the same time, are often followed by emphysema. 4. Cardiac diseases which lead to permanent congestion of the pulmonary capillaries materially aid in its production, by inducing degenerative changes in the walls of the vesicles. 5. Emphysema may be directly brought on by playing wind instruments, excessive effort, lifting heavy weights, straining at stool, climbing hills, and other forms of exertion.

Predisposing causes. Hereditary influence has been supposed to predispose to emphysema, especially in those cases in which it comes on during early life, but this is by no means certain. The complaint is by far most common among persons advanced in years. Children, however, often suffer, in consequence of their liability to pulmonary affections and the weakness of their chest-walls. Gouty and fat subjects are said to be predisposed.

The causation of the several forms of emphysema demands brief consideration. What is termed *acute general emphysema*, which is common in extensive bronchitis, is due to a want of power in expelling the air, in consequence of obstruction, which therefore accumulates in the small air-tubes and inflates the lungs. Many object to this condition being called emphysema, and they name it *insufflation* or *inspiratory expansion*, because there is no actual disease, but merely an inflation of the lungs, which will subside if the obstruction is speedily removed, but if not permanent emphysema is established.

The main difficulty lies in determining the mode of production of *chronic hypertrophous emphysema* following chronic catarrh. It is

regarded by many as being inspiratory in its origin, but Sir W. Jenner considers it to be the result of forcible expiration, and explains its general distribution by the fact that as the lungs and chest enlarge, the relative position of the former to the ribs and intercostal spaces becomes constantly changed, so that successive portions of the lung are brought into correspondence with the spaces, and these being less supported than the parts opposite the ribs, they are unduly distended during cough, and thus ultimately the lungs become more or less emphysematous throughout, though the condition is at the same time most marked at the apices and margins, which are least supported.

Localized emphysema, whether acute or chronic, is probably as a rule developed during expiration. In some instances it is inspiratory, being either substantive or vicarious.

Ordinary *atrophous emphysema* is merely due to wasting of the septa, which become obliterated, so that the vesicles coalesce to a variable degree; in short it is an atrophy of the lung-tissue, usually observed in old age along with other atrophic and degenerative changes.

ANATOMICAL CHARACTERS.—In acute general emphysema the lungs are distended throughout, and do not collapse or may even bulge out when the chest is opened. The degree of expansion varies much. The lungs appear pale, the capillaries being stretched and their network enlarged. The bronchi will be found to be more or less obstructed.

Chronic hypertrophous emphysema is also attended with enlargement of the lungs, and on opening the thorax they are seen to extend beyond their ordinary limits, often covering the pericardium completely, and they may protrude or collapse only very imperfectly, this necessarily depending upon the extent of the disease. Though the morbid condition is more or less general, the apices, anterior borders, and other parts of the lungs which are least supported present the most marked evidences of it, as well as the surface usually. The emphysematous portions have a peculiar soft feel, compared to that of a "cushion of down," and retain the impression of the finger, elasticity being impaired. The so-called crepitant sensation of healthy lung is deficient or absent, and on cutting a dull creaking sound is often heard. The tissue is pale, bloodless, and dry, but presents irregular spots of black pigment derived from altered blood in obliterated capillaries. The vesicles are seen to be enlarged more or less, varying usually from a hemp-seed to a pea in size, but often many of them are thrown into one, giving rise to irregular spaces of considerable size, traversed by slender bands, the septa being visible as slight ridges or having disappeared entirely. Contiguous lobules may freely communicate, and ultimately nothing be left but a coarse network. These appearances are best observed after inflating the lung, drying it, and then making a section.

The nature of the changes in the alveolar walls has been much discussed, but there is no reason whatever to suppose that these should be identical in all cases. The violence of the pressure may rupture the septa and walls directly, but usually their destruction is gradual. They become stretched and atrophied; present perforations varying in size and number; and ultimately only traces of them are seen, or they may disappear altogether. The structural alterations which have been described are the formation of an imperfect fibrous tissue, inducing toughness and thickening, as the result of long-continued congestion (Jenner); or fatty degeneration (Rainey). Dr. Waters of Liverpool considers that this is a primary malnutrition of the pulmonary tissue, leading to its degeneration, but the exact nature of this he has been unable to ascertain. The elastic and other elementary tissues disappear. The capillaries in the affected part become stretched, narrowed, obliterated, or some of them even rupture. Ultimately they are absorbed, and only pigment, the remains of the blood-coloring matter, is left behind.

In the localized variety of emphysema, the appearances are confined to certain parts, especially the apices and anterior and lower edges, being similar to those described as characteristic of the more extensive form.

In true atrophous emphysema the lungs are diminished in size; shrink into a very small bulk when the chest is opened; and are very light. The divisions between the lobes are unusually vertical. The pulmonary tissue is pale but much pigmented, dry, and deficient in elasticity. The vesicles are enlarged, owing to atrophy of the septa.

Other morbid conditions are often seen in emphysematous lungs, such as bronchitis, collapse in some parts, or, not uncommonly, dilated bronchi. Pleuritic adhesions generally exist. When the emphysema is extensive, the contiguous structures are displaced, and after a time all the organs of the body become the seat of congestion and the resulting changes. Different statements have been made as to the position of the heart. My own observation would lead me to agree with those who describe it as lying with the right border horizontally on the diaphragm, and the apex too much down and to the left. Its right cavities become dilated and hypertrophied in course of time.

SYMPTOMS.—It is only chronic hypertrophous emphysema which leads to any prominent symptoms, and these are chiefly indirect. This condition interferes with the due aeration of the blood, and the pulmonary circulation is obstructed from several causes, but especially on account of the destruction of the capillaries; this reacts on the right side of the heart, causing its dilatation and hypertrophy with tricuspid regurgitation; then the general venous system becomes overloaded, and the various organs and tissues are permanently congested, leading to dropsy and important organic changes. The lungs also are generally the seat

of bronchial catarrh or other morbid conditions; and fits of spasmodic asthma or acute attacks of bronchitis are very liable to occur.

Dyspnœa, variable in degree, is the main symptom directly due to the emphysema. At first there is merely "shortness of breath" on exertion, especially on going up a hill or after a full meal, but ultimately persistent expiratory dyspnœa is experienced, though not accompanied with much distress ordinarily, but rather with a sense of discomfort and uneasiness. It is often relieved by pressing the sides, or lying on the abdomen. After a meal it becomes worse, especially should the patient be suffering from dyspepsia, and it is necessarily much aggravated if bronchitis or asthma should set in. The causes of the dyspnœa are the great interference with the respiratory movements, owing to the depressed state of the diaphragm and the rigid state of the chest-walls; the difficulty in expelling the residual air, and small amount of pure air inhaled; and the actual loss of surface fit for aerating the blood. Cough is generally present, but is chiefly the result of bronchial catarrh, when it is attended with expectoration; otherwise it is dry. There is no pain in the chest dependent directly upon emphysema.

The other symptoms observed in connection with emphysema are indirect. Those due to interference with the circulation will be more conveniently described when considering heart diseases. As the result of the increased respiratory efforts the respiratory muscles hypertrophy; hence the neck often looks large. The fat is absorbed, giving rise to emaciation with strongly-marked features. The symptoms due to imperfect blood-aeration are similar to those already described, only more gradually produced, and there is general apathy and languor, with a flabby and relaxed state of the muscles from this cause.

PHYSICAL SIGNS.—These will necessarily differ much according to the extent and variety of the emphysema, and the morbid conditions with which it is associated. 1. *Shape and size of the chest.* In general hypertrophous emphysema the chest is more or less enlarged, either throughout or only in its upper or lower part. It may assume a permanent inspiratory form, or even go beyond this, becoming "barrel-shaped" and almost circular. There is often a rounding of the chest in front and of the back behind, but sometimes the change in shape is chiefly observed in one of these aspects. The ribs become more horizontal and the spaces wider in proportion to the enlargement, and the cartilages are frequently quite rigid. In localized emphysema there may be corresponding bulging. Atrophous emphysema is associated with a small chest, the ribs being very oblique, the lower ones almost vertical. 2. *Respiratory movements.* Expansion is more or less deficient or absent, and there may be merely a general elevation of the chest. Expiration is prolonged. 3. *Percussion* reveals increased area of pulmonary sound, except in atrophous emphysema; and generally increased amount of resonance with fall in pitch, the sound approach-

ing the tympanitic character, but being usually more or less muffled. If the distension of the lungs is extreme, there is deficient resonance with undue resistance. 4. *Respiratory sounds.* The important change is the great prolongation of the expiratory sound, but this is not observed in the atrophous variety. In pure emphysema the sounds are weak, but of harsh quality. The extent over which they are heard is increased. 5. A crepitant rhonchus, already alluded to, is said to be sometimes heard. Râles due to bronchial catarrh are often present. 6. Vocal fremitus and resonance are quite unreliable. As a rule they are deficient. They may be observed over a larger area than usual. 7. There are signs of displacement of organs, especially of the heart. Epigastric impulse is common. 8. The visible veins often afford signs of obstruction to the circulation, but not in the atrophous form.

PROGNOSIS.—Emphysema is serious in proportion to its extent. It lays the foundation for a very miserable existence in many cases; increases the tendency to bronchial catarrh; and adds greatly to the danger from an acute attack of bronchitis. Once it is thoroughly established it cannot be cured.

TREATMENT.—This part of the subject may be very briefly summed up, not because it is unimportant, but because the principles on which it must be conducted need only be mentioned here, the means for carrying these out being described in other parts of this work. 1. Every precaution must be taken against the occurrence of bronchial catarrh, not only on account of its danger, but because each attack tends to increase the emphysema. Other known causes of emphysema must be avoided. 2. It is very important to look to the state of the alimentary canal, as a deranged condition of its functions frequently considerably increases the discomfort attending emphysema. 3. The conditions associated with the emphysema must be attended to as they arise, especially asthma; cardiac diseases; congestion and its results, including dropsy; and the complications which occur in its course, particularly bronchitis. Narcotics must be used with particular caution. 4. It is often requisite to improve the general health and the condition of the blood by the aid of tonics, iron, and cod-liver oil; or to treat some constitutional diathesis, especially gout. 5. Whether there is any curative remedy for emphysema is very questionable. Degenerative changes may be checked by proper dieting. Strychnine, galvanism, breathing compressed air, and other remedies have been stated to produce some improvement.

A change of climate is often exceedingly beneficial in emphysema. Usually a mild climate not too dry suits best; but it is frequently a matter of personal experience as to which is most suitable. It has been recommended to spend the summer in pine-wood regions, where there is a heavy fall of dew.

II. INTERLOBULAR OR INTERSTITIAL EMPHYSEMA.

ETIOLOGY.—This is a very rare condition, resulting usually from rupture of the air-vesicles, as a consequence of excessive pressure upon their interior during forcible expiration, the glottis being at the same time much contracted. Thus it may be induced by violent cough, laughing, or straining during defecation or parturition. It is said to be not uncommon in croup; and to happen sometimes as the result of extensive collapse. Gangrene of the lung or post-mortem decomposition may lead to the presence of air in the interlobular tissue.

ANATOMICAL CHARACTERS.—Accumulations of air are seen under the pleura, varying in size but generally small, and they may form a border of minute vesicles around the lobules. The air can by pressure be displaced along the course of the boundaries of the alveoli. Superficial collections occasionally give way, opening into the pleura and giving rise to pneumothorax; or into the posterior mediastinum, leading to general subcutaneous emphysema.

SYMPTOMS.—The only symptom which might lead to the suspicion of this morbid state is the occurrence of severe dyspnœa following one of its causes. It is said that a faint *friction-sound* is sometimes heard. Should pneumothorax or general subcutaneous emphysema be produced, they would be indicated by the usual signs.

TREATMENT.—This consists in taking every precaution to prevent the mischief from extending, and attending to its consequences.

CHAPTER XII.

ASTHMA.

THE use of this term is ambiguous, but it may be employed to include all cases characterized by the occurrence of severe paroxysmal attacks of dyspnœa. Four chief forms may be mentioned, viz.: 1. *Laryngeal*. 2. *Bronchial*, either *spasmodic* or *paralytic*, depending upon spasm or paralysis of the muscular fibres of the bronchial tubes. 3. *Hæmic*, due to an abnormal state of the blood or circulation. 4. *Diaphragmatic*, associated with spasm of the diaphragm and other respiratory muscles. Only *bronchial* and *diaphragmatic* asthma need be discussed in the present chapter.

I. BRONCHIAL ASTHMA—SPASMODIC ASTHMA.

ETIOLOGY.—It is not improbable that in some instances there is a

paralytic condition of the bronchial tubes leading to asthmatic attacks. This may be the effect produced by certain poisonous gases, and by paralysis of the vagus nerve. Ordinarily, however, the paroxysms seem to be spasmodic in their origin, being due to spasm of the muscular fibres excited through the nerves, the irritation being either centric, direct, or reflex. The causes of spasmodic asthma may be arranged as follows: 1. The complaint may be idiopathic or primary, there being no obvious source of irritation, and it is then sometimes distinctly periodic. 2. Direct inhalation of certain materials is a frequent cause, such as fog or smoke; different gases and vapors; dust; odoriferous emanations from animals, or from vegetable matters, especially hay, ipecacuanha, and certain flowers. The conditions of the atmosphere breathed frequently influence the occurrence of asthmatic attacks materially, these being especially liable to be brought on by excessively damp or dry air, or by cold easterly winds. Different asthmatic patients present remarkable peculiarities as to the qualities of the air which suits them best, but, as a rule, a rather moist and relaxing atmosphere is least injurious, and that of high and country districts is worse than that of low districts or of large towns and cities. 3. Asthma is very commonly associated with bronchitis, bronchial irritation, or emphysema. 4. Cardiac diseases may induce true spasmodic asthma, by giving rise to pulmonary congestion. 5. Asthma may be gastric in its origin, following the taking of food more or less speedily. In some cases any kind of food will bring on a fit; in others only indigestible or special articles, such as stimulants or sweets. Usually this form of asthma is looked upon as being due to reflex irritation, but Dr. Hyde Salter was of opinion that it generally depends upon an "offending condition of the blood," brought about by the introduction into the circulation of deleterious matters during digestion. 6. Various reflex sources of irritation may induce asthma, *e. g.*, uterine derangements, hardened feces in the rectum, the sudden application of cold to the skin, cold feet, or boils. 7. Occasionally it is centric in its origin, as when it accompanies violent emotion or hysteria, or, very rarely, organic disease about the roots of the vagus nerves. 8. Irritation of the pneumogastric nerves in their course may in exceptional instances be the cause of asthma.

Dr. Berkhardt advocates the following view with regard to the nature of asthma. He considers it to be a symptom attending all diseases of the lungs in which the pulmonary tissue is deficient in elasticity. It most frequently accompanies emphysema, when this is fully developed and during its latent stage of development. In consequence of the deficiency of the elasticity the force of expiration is greatly reduced, and obstacles to the interchange of gases are overcome only by prolonged and unusual efforts. Such obstacles are: 1. Hyperæmia of the mucous membrane causing occlusion of the bronchial tubes, from atmospheric

influences and the inhalation of foreign bodies. 2. Inflammation of the mucous membrane, followed by the production of thick fibrinous sputa. 3. Compression of the bronchial tubes. 4. Interstitial œdema. 5. Embolism of the pulmonary artery.

Predisposing Causes.—A large number of cases commence within the first ten years of life, and they increase in frequency from 20 to 50 (Salter). Men suffer much more than women. Hereditary predisposition appears to have some influence.

SYMPTOMS.—In some cases premonitory indications of the approach of a fit are observed, especially in connection with the nervous system. Occasionally there is an abundant discharge of pale watery urine. There may be gradually increasing dyspnœa and other chest symptoms for a variable period before the actual attack. In many cases, however, this is quite sudden in its onset, coming on without any warning. It sets in, in the great majority of cases, early in the morning, especially from two to three o'clock, but meals, the recumbent position, effort, sleep, and other causes may determine the time of its occurrence. In many instances a distinctly periodic tendency is noticed, which may be remarkably uniform, and either associated with some evident cause or not.

Characters of a Paroxysm.—The patient has an extreme sense of suffocation and want of breath, with tightness and oppression across the chest; loosens every article of clothing, and seizes upon every means for obtaining fresh air. The position assumed varies in different cases, the patient either sitting, standing, or kneeling, and fixing the hands or elbows on some support; many change their attitude frequently. Violent respiratory efforts are made, every muscle being called into action, the shoulders raised, and the head thrown back with the mouth open, and consequently the sweat often pours off the upper part of the body. The rate of breathing is frequently not increased, but inspiration is very short, abrupt, and jerky, expiration greatly prolonged, often terminating with a sudden effort at expulsion, and being immediately followed by the inspiratory act. Respiration is noisy and wheezing. Soon there are signs of overloading of the venous system and non-aëration of the blood, which may become very marked, the extremities being cold, and the pulse small and quick or sometimes irregular. The duration of the struggle varies greatly in different cases, and it may go on for a long time with remissions or intermissions. The length of the fits is often remarkably uniform in any particular case. The attack ends either suddenly or gradually, this depending much upon its duration, and whether it is allowed to run its course or is checked by some powerful agent. Generally a cough sets in towards the close, followed by a small amount of expectoration, in the form of little pearl-like gray pellets of mucus. In some cases the expectoration is considerable and continues for some time, especially if the paroxysm is prolonged, and

then the asthma is termed "humid." Occasionally hæmoptysis occurs, usually very slight, sometimes abundant.

Physical Signs.—During a paroxysm of asthma the physical signs are very characteristic, as evidencing constriction of the bronchial tubes and interference with the passage of air. 1. The chest is frequently enlarged, the lungs being inflated. 2. Expansile movements are greatly deficient or absent, and the intercostal spaces, suprasternal, and supraclavicular fossæ, and the epigastrium sink in markedly during inspiration. The rhythm of the movements is altered as already described. 3. Percussion-sound is extra-resonant, and inspiration or expiration produces no effect upon it. 4. Auscultation discloses feeble or absent breath-sounds where the tubes are constricted; loud puerile sounds where they are free; also dry râles in every conceivable variety. At the close some moist râles may often be heard. Important characters as regard these auscultatory signs are, that they are frequently limited in their extent, and constantly liable to change their place rapidly. Upon the sudden cessation of spasm an exaggerated breath-sound may be heard where a moment before there was none at all. Usually both lungs are affected, but occasionally only or chiefly one of them, and then breathing is in excess on the unaffected side.

State in the Intervals.—This will depend upon whether the asthma is due to organic disease or not. Immediately after an attack there is usually a feeling of exhaustion, with uncomfortable sensations about the chest; but when these pass off patients generally feel relieved, and enjoy an immunity from further paroxysms for a time. As a case progresses, the fits tend to become more frequent but less severe.

It is necessary briefly to allude to the variety named "hay asthma," or "hay fever." This appears to be due to idiosyncrasy, being only observed in particular subjects, who suffer every hay season, often without any evident exposure to the exciting cause. The same effects may be produced by breathing the powder of ipecacuanha. The symptoms are those of coryza and bronchial irritation, attended with severe cough, short asthmatic attacks, especially at night, as well as much languor and a sense of depression and want of energy, but no pyrexia. They set in speedily, and last a variable time.

DIAGNOSIS.—Bronchial asthma is sufficiently characterized by the paroxysmal and usually sudden nature of the attacks; their peculiar characters, severity, duration, and often sudden termination; the physical signs of temporary constriction of the bronchial tubes, but not of fluid in them; the effects of treatment; and the complete or comparative absence of dyspnœa in the intervals. It has chiefly to be distinguished from emphysema, bronchitis, and cardiac dyspnœa, but it must be remembered that asthma may complicate these. It may also resemble laryngeal asthma.

PROGNOSIS.—The immediate prognosis is favorable, death during a

fit of asthma being a rare event. The prognosis as to recovery is more hopeful if the patient is young; if the attacks only come on at long intervals, and are not severe or prolonged; if in the intervals the patient is well, and there is no organic disease; and if the paroxysms can be traced to some obvious cause, which may be avoided. The history of the progress of the case will give some aid in arriving at a prognosis.

TREATMENT.—1. *Prevention of an Impending Attack.*—In those cases where there are premonitory signs of a fit of asthma, it may be possible to avert this by drinking strong coffee; removing every source of irritation; heating the body, or in some cases applying cold to the back; smoking stramonium or belladonna; and various other remedies.

2. *Treatment during the Paroxysm.*—Any obvious exciting cause must be at once removed; thus a loaded stomach or rectum will require an emetic or enema; as much fresh, dry, warm air as possible must be obtained; and everything that can obstruct the breathing should be loosened. The position of the patient needs to be studied; the sitting or kneeling posture is usually the best, with the elbows supported so as to raise the shoulders.

The remedies recommended for asthma are exceedingly numerous, chiefly belonging to the class of depressants, sedatives and antispasmodics, or stimulants. Different cases are relieved by totally different treatment, and at first it is quite an experiment as to what will suit best, but patients learn by experience what gives them most speedy relief. The chief remedies which may be of service when given internally are depressing emetics and nauseants, especially ipecacuanha or tartar emetic; tincture of belladonna, conium, hyoscyamus, datura stramonium or tatula; opium or morphia; ether; tincture of lobelia in gradually increasing doses, frequently repeated; cannabis indica; strong hot coffee, without milk or sugar, taken on an empty stomach; some spirit with boiling water in equal parts; or fragments of ice rapidly swallowed. Inhalations are most valuable, some of them being directly inspired; others being smoked, either in a pipe or cigarette. The most important remedies for direct inhalation are ether, chloroform, or a mixture of these; nitrite of amyl, which has been strongly recommended by Dr. Talfourd Jones of Brecon, but must be very cautiously employed; and the white fumes which arise from ignited nitre paper. The principal substances smoked are tobacco, stramonium, belladonna, or a mixture of these, and great relief is often thus obtained, but of course great care must be exercised in conducting this mode of treatment. Subcutaneous injection of morphia is beneficial in some cases.

Various other measures prove beneficial in some instances, such as applying cold or heat to the surface of the chest; ice to the spine; warm frictions; turpentine fomentations; sinapisms to various parts; putting the hands and arms into warm water; a warm foot-bath with mustard in

it, cold water being drunk at the same time; or a weak galvanic current along the course of the vagus nerves.

3. *Treatment during the Intervals.*—At this time the main points to attend to are to study the locality which suits the patient best, as regards the qualities of the air and other conditions; to pay strict attention to the state of the alimentary canal and to the diet, as well as to the functions generally; and to avoid everything which is known to bring on an attack of asthma. In many cases the habitual use of some of the remedies already mentioned may ward off the fits, such as smoking tobacco or stramonium, or inhalation of the fumes of nitre-paper or chloroform. If any organic disease is present, this must be treated accordingly. A course of quinine, strychnine, or some metallic tonic is very serviceable in many cases. Galvanism or counter-irritation along the vagus nerves; the inhalation of compressed air; and various other measures have been advocated.

With regard to hay asthma, it is necessary to avoid the cause of this, and the seaside seems to offer the best protection, or if possible a voyage should be taken. During the attack small doses of hydrocyanic acid with tincture of lobelia or other antispasmodics may be given at frequent intervals. Weak inhalations of creasote or chlorine have been recommended; and also injection of quinine into the nostrils. As preventive measures, the administration of quinine and iron, arsenic, nuxvomica or strychnine, and other tonics might be tried, along with cold bathing. Dr. Reynolds found the systematic inhalation of a few drops of chloroform useful.

II. DIAPHRAGMATIC ASTHMA.

A form of asthma has been described, supposed to be due to spasm of the diaphragm and other muscles of respiration, and having the following characters. The respirations are diminished in number, and the difficulty in breathing is limited to expiration, which is greatly prolonged, inspiration being short and abrupt, while but little air enters the lungs. The abdominal muscles become rigid and hard, and may cause expulsion of the urine and fæces. There is much distress, and signs of imminent suffocation may appear. Should the spasm subside, this is not followed by cough or expectoration. Physical examination reveals distension of the lungs, undiminished during expiration. There are no dry râles, such as are heard in spasmodic bronchial asthma. I have seen symptoms very similar to those described come on after an immoderate fit of laughter.

CHAPTER XIII.

*ATELECTASIS—APNEUMATOSIS—PULMONARY COLLAPSE—
PULMONARY COMPRESSION—CARNIFICATION.*

THESE terms all signify conditions in which the lungs are to a greater or less extent merely devoid of air, so that the affected portions are useless for respiratory purposes. *Atelectasis* strictly refers only to lungs more or less in their foetal condition, not having expanded properly. The other terms indicate a return to this condition, either from collapse in consequence of air being prevented from entering the vesicles through the bronchi; or as the result of external compression of the lung.

ETIOLOGY.—1. *Collapse*.—The results of experiment and observation show that the ultimate effect of complete and continued obstruction or narrowing of a bronchial tube from any cause is collapse of the vesicles which it supplies. The explanation of this is as follows: The bronchi become smaller as they divide, and the air drawn in during inspiration drives on any obstructing material, so that at last it reaches a point where it causes complete closure, and thus no air can enter the vesicles. During expiration the obstructing plug is forced out to some extent, and a certain quantity of air escapes, but it again returns with inspiration, acting in fact like a "ball-valve." Thus, as no new air enters the vesicles, and that previously contained in them is gradually expelled, they finally collapse entirely. It is supposed also that some of the imprisoned air may be absorbed. In the great majority of cases the obstruction is associated with bronchitis, either simple or complicating measles, whooping-cough, or croup, especially if its products are very tenacious and viscid, but they need not be of this character. Infants are extremely prone to suffer from collapse, and this condition is especially frequent during the first year of life, and in children who are ill-nourished or rickety. Among the chief predisposing causes are a yielding condition of the chest-walls and a weak state of their muscles; inability to cough or expectorate; distension of or pressure upon the abdomen, preventing the movements of the diaphragm; and the previous existence of atelectasis.

When pressure is exerted on a main bronchus, as by an aneurismal or other tumor, the whole lung may ultimately become collapsed.

2. The chief causes of direct *compression* of the lung are accumulations of fluid or air in the pleural cavity, or agglutination of its surfaces; great pericardial effusion or cardiac enlargement; intrathoracic tumors or aneurisms; deformities of the thorax; and excessive abdom-

inal enlargement, from ascites, ovarian tumors, enlarged liver or spleen, hydatids, or other conditions.

ANATOMICAL CHARACTERS.—The appearances in atelectasis and collapse are very similar. Usually distinct lobules are involved, scattered through different parts of the lungs. The margin of the basis, the tongue-like prolongation of the left upper lobe, and the middle lobe of the right lung, present collapsed lobules most frequently; and next the back of the upper and lower lobes on both sides. Superficial lobules are much more commonly affected than those which lie deep in the lungs.

The characters will vary according to the duration of the collapse, and the amount and conditions of the blood in the affected lobules. At first there is congestion, but soon the blood coagulates in the vessels and then undergoes changes, becoming decolorized, firm, and contracted, the vessels being finally obliterated. The walls of the alveoli after a time adhere together, and catarrhal pneumonia is frequently set up. As seen on the surface of the lung, the collapsed portions have a well-defined outline, and are usually sunk below the surrounding level, but not always. Their size depends upon that of the bronchus obstructed. The color varies considerably, ranging from deep purple to light red, but being usually dark red or of a somewhat violet hue. Whitish streaks are evident on close examination, indicating the divisions into smaller lobules. A section is quite smooth, but varies in color, and it shows the collapsed part to be somewhat pyramidal in shape, with the base outwards. The tissue is quite airless and non-crepitant, usually of a tough and firm consistence, and when situated in a thin margin the collapsed portion may be felt between the finger and thumb. Pieces sink in water. The affected lobules can usually be inflated to a greater or less degree by means of a blowpipe introduced into the communicating bronchus, and they then enlarge, assume a light-red color, and come to resemble normal lung-tissue, but they soon subside unless the bronchus is tied. In proportion to the degree of congestion will be the depth of color, bulk, firmness, and difficulty of inflating the collapsed portions. In course of time they become paler, looser but tough in texture, and cannot be expanded, as the walls of the vesicles adhere. The tubes proceeding to them will usually be found to contain some obstructing secretion. Other parts of the lungs are frequently the seat of emphysema.

Compression drives the air and blood out of the lungs to a variable degree, and the appearances differ accordingly. When only the air is expelled, the blood remaining, the lung-tissue is dark red, moist, but very firm and dense, and this is the condition known as "carnification." Finally it becomes gray; anæmic, but pigmented; dry; of a tough leathery consistence; and incapable of insufflation.

SYMPTOMS.—Dyspnœa, with quick and shallow breathing; feeble and

ineffectual cough; signs of deficient blood-aeration; and marked wasting and exhaustion are the phenomena attending pulmonary collapse, their severity being necessarily in proportion to the extent of the mischief and the rapidity with which it is set up. Death is a very frequent termination in children, and may take place speedily or gradually. The *physical signs* are: 1. Those of inspiratory dyspnœa, the chest falling in more or less. 2. Dulness over the affected parts. 3. Weak or bronchial breath-sounds. In many cases, however, there are no physical signs whatever, and they may be obscured by emphysema, bronchitis, and other morbid conditions.

Considerable compression may exist without any symptoms, if it is produced gradually. In this condition a few dry crepitant râles may sometimes be heard at the close of a deep inspiration—*compression-rhonchus*; and the heart is often unduly exposed.

PROGNOSIS.—Extensive collapse is exceedingly dangerous in children, especially if very young, feeble, and placed under bad hygienic conditions; it adds greatly to the fatality of bronchitis, whooping-cough, measles, and croup.

TREATMENT.—When collapse is expected during an attack of bronchitis in children, the main objects in treatment are to assist the efforts at breathing and the discharge of the obstructing secretion. Friction with oil over the chest, as recommended by Dr. Graily Hewitt; artificial respiration; the application of sinapisms; an emetic of sulphate of zinc or ipecacuanha; and the administration of expectorants, constitute the chief measures which are of use. A warm bath is of service occasionally. The diet must be carefully attended to, and much support is often required, adapted to the age of the patient; stimulants are also frequently useful. If there are signs of apnœa, the warm bath with the cold douche should be tried. As regards compression, the removal of its cause as speedily as possible is the chief indication.

CHAPTER XIV.

PHTHISIS—PULMONARY CONSUMPTION.

UNQUESTIONABLY several distinct affections are included under this term, all of which, however, tend to produce similar results, viz., consolidation followed by destruction of the lung-texture; and wasting of the blood and tissues of the body. In this work little more can be done than to give an outline of the main facts bearing upon phthisis, and of the principal views entertained, more especially as regards the pathology of the disease.

ETIOLOGY.—*Hereditary or Family Predisposition*.—There can be no doubt as to the existence of an inherited tendency to phthisis, but the proportion of cases in which this is apparent has been very differently stated by different observers. Further, many consider that a *specific diathesis* is thus transmitted, whereas others believe that it is merely a *constitutional debility*, and that this may be present in children born of parents in a low state of health from any cause, as well as in those derived from consumptive parents. Dr. C. T. Williams has arrived at the following conclusions on this subject: 1. Family predisposition occurs more commonly among, and exercises a more decided influence on, females than males; and the former have a great power of transmission than the latter. 2. Fathers transmit more frequently to sons, and mothers to daughters, than the converse. 3. Family predisposition does not directly shorten the duration of the disease. 4. It precipitates the onset of the disease, and thus shortens the duration of life. *Age*. Most cases are met with from 20 to 30 years of age. The disease is not often observed during early childhood or in advanced age, but may come on at any period of life. It is more rapid in its progress usually in the young. *Constitutional condition*. Persons who are feeble and delicate are most liable to be affected. *Occupation*. Phthisis is very common among those whose employment exposes them to various irritant inhalations; to causes of cold; or to the influence of certain unfavorable hygienic conditions. *Habits*. Sedentary habits and want of exercise, intemperance, masturbation, excessive sexual indulgence, and debauchery generally, are the chief causes of phthisis coming under this head. *Diet and digestion*. The malnutrition resulting from an imperfect supply of nutriment to the system from any cause has a powerful influence in developing phthisis, especially in the young. This may be associated with an insufficient amount or improper quality of food, or with a want of power of assimilation on account of dyspepsia and various diseases interfering with digestion. Some observers have laid great stress on a deficiency of fat in the system as a cause of phthisis, either from its not being supplied, or because it cannot be digested. *Interference with respiratory functions*. The want of ventilation and fresh air, and consequent breathing of an impure atmosphere, materially assist in the production of phthisis; hence it is so common among those whose occupation compels them to remain in a close confined room for many hours during the day, as well as in many instances during the night, such as seamstresses or tailors. It is also frequent in ill-ventilated institutions where many persons are gathered together, especially children, *e.g.*, orphan asylums and prisons. Whether interference with the respiratory movements due to pressure of stays or posture has any effect in the production of phthisis, is a matter of dispute. Dr. McCormac attaches great importance to "rebreathed air" as a cause of consumption. *Climate and locality*. Dampness of soil

and abundant moisture in the atmosphere have been proved to be powerful predisposing causes of phthisis. It is most prevalent in those climates characterized by rapid changes of temperature, or prolonged cold with damp. The true tubercular form is said to be favored by a high temperature. Elevated regions are remarkably free from phthisis, while those which are low present a large number of cases. It has been stated that malarial districts are comparatively free from the disease.

Mental causes. Severe mental depression, as from anxiety, grief, or overstudy, certainly seems to have considerable influence in some cases. Phthisis is not uncommon among the inmates of lunatic asylums. *Previous and existing diseases.* Phthisis may follow measles, whooping-cough, croup, typhus, typhoid, scarlatina, and other acute diseases. Repeated attacks of bronchitis greatly favor its development; and it may result from pneumonia, especially catarrhal; pleurisy; and possibly laryngitis. Under this head may be mentioned miscarriages, bad confinements, prolonged lactation, and the suppression of discharges, all of which certainly increase the tendency to consumption. It is liable to set in during the course of diabetes, and in diseases of the alimentary canal and other parts which interfere with the consumption or assimilation of food. Dr. Pollock has remarked that young women who are anæmic or chlorotic are peculiarly free from phthisis, but it does sometimes attack such subjects, and may come on very insidiously. *Infection.* It has been imagined that consumption is capable of transmission by infection through the breath, but the evidence of such a mode of origin is extremely unsatisfactory.

Such are the principal causes which may lead to phthisis. It is not practicable to divide them into *predisposing* and *exciting*, as most of them may under different circumstances belong to either class. They may be separated into two groups as regards their mode of action, the one tending to induce a low unhealthy state of the constitution; the other to cause local irritation in connection with the pulmonary organs. In the great majority of cases several causes have been at work, and often there is a combination of both classes. With regard to the immediate origin of phthisis, it may or may not be traced to some definite *exciting cause*, such as a cold or any other source of pulmonary irritation.

PATHOLOGY.—Until within the last few years phthisis was almost universally looked upon as essentially a *tubercular* disease, depending upon the deposit and ultimate breaking down of tubercle in the lungs, causing destruction of tissues with the formation of cavities. The importance of inflammatory processes in the production of this disease had been recognized by a few observers, such as Addison, Williams, and others, but it is only comparatively recently that they have been assigned the prominent position which they now occupy with many pathologists. There is a very wide difference of opinion, however, upon

this subject at the present day. Undoubtedly phthisis has different modes of origin, and in the following remarks it is proposed to indicate the various ways in which the consumptive process might arise, in accordance with the principal views entertained.

1. *Inflammatory Forms of Phthisis*.—(i.) A comparatively few cases of phthisis result directly from an attack of *acute croupous pneumonia*, especially if this affect the apex of the lung, the inflammatory products undergoing caseation instead of being absorbed, and ultimately breaking down, leading to disintegration of the pulmonary tissue. It has been suggested by Dr. Williams that a continued high temperature and other agencies may have the effect of hardening the cells in the exudation, lowering their vitality and preventing their development or removal.

(ii.) *Catarrhal pneumonia*, either *acute* or *chronic*, is the variety of lung inflammation to which Niemeyer attributed the origin of the large majority of cases of phthisis, and he believed that this might arise under the following circumstances: *a.* As the result of extension of a simple acute or chronic bronchitis from cold into the air-vesicles. He was of opinion that this might occur in a person constitutionally strong, but that it is more liable to happen in the case of those who are debilitated and in a low state of vitality, and that the products are in such subjects more likely to undergo the destructive processes to be presently mentioned. Most cases of *acute* or *galloping consumption* were attributed by him to catarrhal pneumonia complicating extensive acute bronchitis. *b.* From inflammation set up in collapsed lobules associated with bronchial catarrh, *e. g.*, after measles or hooping-cough. *c.* By extension of inflammation due to the inhalation of irritant particles in certain occupations into the air-vesicles. *d.* As the consequence of the irritation of blood poured out into the bronchial tubes, which, instead of being expectorated, has remained, become coagulated, and set up inflammation.

The explanation of the destructive changes, as described by Niemeyer, is as follows: Cells, the products of inflammation, accumulate in the alveoli and minute bronchi, crowd upon each other, becoming densely packed, and thus by their mutual pressure they bring about their own decay, as well as that of the lung-textures, by interfering with their nutrition, the alveolar walls being also themselves damaged by the inflammatory process. The morbid materials therefore become caseous, and may undergo calcification or absorption, or be ultimately discharged, giving rise to cavities.

Different observers have described special forms of pneumonia as leading to phthisis, which they designate albuminous, scrofulous, tubercular, caseous, etc., but Niemeyer denied that the inflammation has ever any specific characters, and affirmed that all varieties may end in

caseous degeneration and consequent phthisis. My own experience is decidedly in favor of Niemeyer's views on this point.

(iii.) *Chronic interstitial pneumonia* leads to destruction of the lung, and, as already mentioned, this morbid condition is termed "fibroid phthisis." It affects to a greater or less extent most phthisical lungs.

2. *Phthisis from new growths or deposits.* The usual new growth or deposit which originates phthisis is *tubercle*. Niemeyer held that *primary tubercular phthisis* is rare, and that when tubercle is found in these organs, which is by no means always the case in consumption, it is as a rule secondary to caseous degeneration of some inflammatory products, being formed chiefly in the neighborhood of these; or, should it be primary, some cheesy masses, or other sources of infection, will be found in other parts of the body. He considered that acute deposit of tubercle in the lungs is more likely to occur as a primary event than chronic; that primary tuberculosis is observed with greater relative frequency in those who are predisposed to inflammation ending in caseous degeneration; that the greatest danger for most consumptives lies in their liability to become tuberculous; and that, though tubercle may give rise to pneumonia, this is far less extensive than when the inflammation is the original mischief.

On the other hand many eminent authorities will not accept these views, but maintain that the formation of tubercle is the first step in the consumptive process in most cases, and that this morbid product undergoes degenerative changes, at the same time by its irritation exciting inflammation; in short, that as a rule phthisis is essentially a constitutional, tubercular disease.

It cannot be doubted but that many of the morbid conditions described as tuberculous infiltration, gelatinous infiltration, etc., are not associated with tubercle at all, but are inflammatory in their origin.

Under the class of new growths may also be mentioned those rare cases of destruction of lung which are apparently associated with the breaking-down of *sypilitic gummata*.

Having thus considered the *etiology* and *pathology* of phthisis generally, it will be expedient in the subsequent treatment of the subject to give a separate account of the disease as it occurs in its *acute* and *chronic* forms.

I. ACUTE PHTHISIS—GALLOPING CONSUMPTION.

ANATOMICAL CHARACTERS.—Now and then the post-mortem examination merely reveals the remains of an acute croupous pneumonia, which has ended in destruction of the lung-tissue. In more cases there are evidences of extensive bronchitis with catarrhal pneumonia, which may invade large tracts of lung-tissue, the products being soft and caseous and easily breaking-down, or irregular cavities of various sizes

having formed here and there. The lower lobes are usually most involved. There are signs of more or less pleurisy. In other instances the pulmonary affection is but a part of acute tuberculosis, the lungs in common with other organs being studded throughout with gray miliary tubercles, at the same time being much congested, especially in dependent parts, but not inflamed. In this form caseous masses will frequently be found either in the lungs or elsewhere.

SYMPTOMS.—The clinical history of acute phthisis is that of a febrile disease, attended with prominent pulmonary symptoms, and as a rule with signs of consolidation and destruction of the lungs. It may attack a person previously healthy to all appearance, but this is not usually the case. Hæmoptysis is sometimes the first symptom. The course is in some instances extremely rapid and virulent, but any case of phthisis ending within a few months would be considered acute.

When acute phthisis follows croupous pneumonia, it is indicated by a continuance of the chest symptoms and fever, with abundant sweats and wasting; while the *physical signs* show persistence of the consolidation, followed by softening and the formation of cavities. When associated with bronchitis and catarrhal pneumonia, the local symptoms are pains about the chest; considerable dyspnœa; frequent cough; and abundant expectoration, which may be "rusty." There is considerable pyrexia, especially at night, with much sweating, and often rigors, rapid wasting, and great debility. *Physical signs* at first reveal merely bronchitis. Afterwards there will be indications of consolidation, softening, or excavation in various parts, often most marked towards the bases, viz., dulness; bronchial or hollow breath-sounds; crackling, followed by large, moist, often ringing râles; and increased vocal fremitus and resonance. Pleuritic friction-sound is also heard in many cases.

In the acute tuberculous form the symptoms are those of very high fever, with intense prostration and adynamia, as described under acute tuberculosis; as well as extremely hurried breathing and cough, but no marked physical signs, there being only râles significant of pulmonary catarrh, and subsequently of œdema. There may be evidences of tubercle in other parts.

DIAGNOSIS.—This subject will be again considered; at present it is only necessary to mention that care must be taken to avoid confounding acute phthisis with certain specific fevers.

TREATMENT.—According to the nature of the case, the treatment of acute phthisis will either be that of ordinary pneumonia; extensive catarrh with catarrhal pneumonia; or of acute tuberculosis. Lowering measures are not borne, but a supporting and stimulating plan of treatment is indicated. If there is high fever, full doses of quinine may be given, or the application of cold cautiously tried. Various symptoms, such as pain, cough, dyspnœa, hæmoptysis, and sickness, often need attention. Local applications to the chest, in the form of poultices,

sinapisms, turpentine fomentations, or blisters, are frequently serviceable.

II. CHRONIC PHTHISIS.

ANATOMICAL CHARACTERS.—The appearances observed in the lungs in chronic consumption vary greatly in different cases, according to the nature of the destructive process; the changes which have taken place during its progress; and the other morbid conditions with which it is associated. As a rule, but not always, the disease begins and is most extensive and advanced at the apices, the entire upper lobes becoming afterwards involved from above down, and subsequently the lower, so that the disease is seen at various stages, often retrograding in one part while extending at another, while it may be of a different nature in different portions of the lungs. In persons who die of phthisis, both lungs are usually implicated to a greater or less extent, though not equally. The disease, however, may be limited to one lung, or even to a small portion of it, and may undergo curative changes, so that when the patient dies from some other cause, evidences of former pulmonary disease are observed.

The primary morbid condition in the development of phthisis is consolidation of some kind. This may originally present the characters of the ordinary gray hepatization of pneumonia, but only in very exceptional cases; of, most commonly, a gelatinous-looking infiltration, grayish, homogeneous, and smooth on section, at first limited to lobules, but afterwards involving the pulmonary tissue extensively, and supposed to be due to catarrhal pneumonia or infiltrated tubercle, according to the view entertained with regard to its pathology; or of gray miliary tubercles, either separate, or, more frequently, in groups. The formation of true tubercle is probably in the large majority of cases a secondary process, but may be primary, and it is produced either in the perivascular sheaths; in the walls of the air-vesicles; in the mucous membrane of the bronchi; or in the adenoid tissue near these.

The tendency in all these morbid products is to undergo caseation and disintegration to a variable degree and extent, either rapidly or gradually. As a result considerable alterations in aspect and other characters are observed. The affected parts become yellow, opaque, and soft, and give rise to the appearances formerly considered characteristic of yellow tubercle. When tubercles become caseous small yellow nodules are seen, but these are frequently simulated by a section of a bronchial division or of alveoli inclosing caseous matter. There is no doubt but that complete liquefaction may take place ultimately, followed by absorption or expectoration of the morbid products, and ultimate recovery. Frequently calcification ensues, hard calcareous nodules or masses remaining in the lungs. The further course of phthisis, however, is characterized ordinarily by the continued softening of the mor-

bid materials, which are finally discharged through the bronchi and expectorated, cavities, excavations, or vomicae being thus originated in the lungs. These vary greatly in number, form, size, and other characters. Often they are of wide extent, in consequence of continued enlargement and coalescence; or several may communicate together in an anfractuous manner. They increase by an infiltration of the walls, which become caseous and disintegrate; or by the formation and destruction of secondary tubercle. Their walls are irregular at first, and they contain generally a purulent-looking substance; or sometimes a dirty, thin, and fetid liquid. A variable number of bronchi are seen opening abruptly into a cavity, either directly or slantingly, and presenting circular or oval orifices. Obliterated branches of the pulmonary artery may be observed on the walls or passing across the cavity, but sometimes they are not closed, and may be the seat of small aneurismal dilatations or "ectasias," thus greatly increasing the liability to fatal hæmorrhage. Obliterated bronchi and thickened fibrous brands also traverse the space. Niemeyer was of opinion that most of the cavities seen in phthisical lungs are due to dilated bronchi, but it is impossible to agree with this statement.

An important secondary process set up in most cases of phthisis is that indicative of chronic interstitial pneumonia, which materially aids in arresting and repairing the mischief resulting from the disease. This arises in the neighborhood of consolidations and caseous substances, sometimes forming dense capsules around them or indurated masses; and also around cavities. The latter after a time tend to become smooth and apparently lined by a membrane, should the consumptive process cease; subsequently they may gradually contract and finally close up, leaving only an indurated puckered cicatrix. In some very chronic cases of phthisis the lungs may present nothing but fibroid induration, with cavities in various stages of contraction. It must be remembered that this last condition originates in a different manner from that associated with ordinary "fibroid phthisis."

In addition to the diverse appearances in the lungs resulting from the combination of conditions already described, these are generally further modified by signs of bronchitis, often with ulceration of the mucous membrane; dilated bronchi; emphysematous patches; pulmonary collapse; extravasations of blood; or recent pneumonia. Pleuritic adhesions and thickenings are always evident, especially at the apices, where there is often a dense fibrous cap, half an inch or more in thickness. In these adhesions new vessels form by extension from the intercostals, and thus a communication is formed between these and the vessels of the lungs.

Other structures besides the lungs are generally involved in phthisis, as will be pointed out when considering its complications.

SYMPTOMS.—Chronic phthisis presents considerable variations in its

clinical history, both as regards its mode of onset and its subsequent course, but the symptoms bear a general resemblance, in the different cases. The disease may commence quite suddenly, as by an attack of hæmoptysis; or may remain after some acute affection; or may come on acutely, afterwards subsiding into a chronic stage; or may set in gradually and insidiously. In the latter case the pulmonary symptoms are first observed in some instances, especially those indicating chronic bronchial catarrh; in others, signs of constitutional disturbance or derangement of the digestive organs are noticed at the outset. The symptoms may be described as *local* and *general*.

Local.—Pains in the chest and sides are common, though not usually severe. They seem generally to be either pleuritic or muscular, the latter being often the result of cough. Dyspnœa is frequently present more or less from various causes, but may be entirely absent. Respirations are often increased in number, rising somewhat towards evening. Shortness of breath on exertion is very commonly complained of. Of course when the lungs are extensively diseased breathing is much affected. Cough is an essential symptom, and may for some time be the only one complained of. In its severity and characters it differs widely, and that by no means according to the extent of disease. At first it is often dry and hacking. An abnormal condition of the throat or larynx not unfrequently gives rise to cough, in the latter case it being generally of hoarse quality. It is usually worse on first lying down at night; after sleep; and after meals. A paroxysm is often terminated by vomiting, especially after food has been taken. Expectoration soon occurs in most cases, but much of the sputa often come from bronchial tubes which are the seat of catarrh. Their characters and amount alter during the course of a case, and they present much variety in these respects. At first they consist merely of clear mucus, or sometimes small opaque pellets are discharged; subsequently they become muco-purulent; and when cavities form, irregular, opaque, airless masses are expectorated, more or less greenish-yellow, which sink in water, and which when discharged on to a flat surface, spread out in the form of a coin, hence named "nummulated." This kind of sputum is not characteristic of cavities, however, as it may be observed in mere bronchitis. The masses are mingled with more or less bronchial mucus. In some cases mere pus is expectorated, and occasionally a quantity of this is suddenly discharged, owing to the opening of a cavity. The sputa often have an unpleasant odor, and may be extremely offensive, but this is not common. In favorable cases, even after large cavities have formed, expectoration diminishes and may ultimately cease altogether. Examination of the sputa may reveal caseous or calcareous particles. Microscopic examination discloses epithelium; abundant newly-formed granular and pus-cells; blood-corpuscles; numerous fat-granules and oil-globules; calcareous granules;

vegetable growths not uncommonly ; and, in some instances, fragments of lung-tissues, especially elastic fibres, the last being a sign of great importance. Sugar may be detected chemically.

Hæmoptysis requires special notice. It is observed to a greater or less degree in the great majority of cases of phthisis, varying, however, considerably as regards the amount and exact characters of the blood discharged, and the frequency of its occurrence. It may range from mere streaks in the sputa to a quantity sufficient to prove immediately fatal, but death directly due to hæmoptysis is not a common event in phthisis. When blood is intimately mixed with muco-purulent matter, it has been stated to be pathognomonic of chronic pneumonia. The hæmoptysis is frequently, but not necessarily, brought on by some exciting cause, such as violent cough. In certain cases it tends to be repeated, and may be almost periodic. When not abundant it seems to give a patient relief sometimes, but usually the result of hæmoptysis, if in any quantity or if repeated, is to induce debility and anæmia, or it may increase the local mischief.

It is believed by some authorities that the blood generally comes from the bronchial capillaries, but probably the pulmonary vessels are its usual source. These have been supposed to be in a state of fatty degeneration, and, as already remarked, considerable branches may remain unobliterated or be the seat of ectasias, and by their rupture give rise to fatal hæmorrhage.

General.—Pyrexia is a very important symptom in phthisis, and one which should always be looked for by the systematic use of the thermometer. This instrument is particularly important in detecting an early stage of the disease, and indicating its degree of activity. It has been also stated to aid in determining the nature of the destructive process, tubercular phthisis being characterized by a more continuous fever than the other forms. This is a very questionable statement, however. As a rule marked daily variations in temperature are observed, and it increases considerably in the evenings. Towards the close of many cases of phthisis hectic fever in its most typical form is observed. Night-sweats are complained of in the large majority of cases. These tend to come on especially towards early morning, but not unfrequently they set in as soon as the patient falls asleep, and may be so excessive as to saturate the bed-clothes, causing much distress and exhaustion. Loss of flesh is another prominent symptom, being dependent chiefly upon the pyrexia. This must be determined by frequent weighing, and no reliance ought to be placed on the mere statement of the patient. The emaciation is often extreme, and it is a matter of common observation that it is more marked about the body and limbs, and especially the chest, than the face. The fat disappears and the muscles feel flabby and wanting in tonicity. The chest-muscles are often very irritable on percussion. More or less anæmia is frequently observed, the patient

being pale, and there may be œdema of the legs from this cause. At first the blood is generally hyperinotic, but soon it deteriorates in quality. In many advanced cases the skin is dry and scaly. Among other external appearances which may be noticed are chloasma over the chest; grayness of the hair in this region; lankiness and falling off of the hair generally; bulbousness of the finger ends, with incurved or cracked nails.

The patient almost always complains of debility, varying in degree to the most absolute helplessness and exhaustion. The pulse is increased in frequency, and tends to be quick, sharp, small, and wanting in tone.

The digestive organs are generally out of order. Loss of appetite, thirst, and dyspeptic symptoms are often complained of. Not uncommonly the mouth, tongue, and throat are red and irritable, this being accompanied with signs of subacute gastritis. In some instances the stomach is extremely irritable, retching and vomiting being immediately excited when anything is taken. The breath has in not a few cases a very peculiar odor, which has appeared to me to be quite characteristic. At the close thrush is not infrequent. It has been stated that phthisical patients have a peculiar dislike to, and difficulty in the digestion of, fatty substances, but there are many exceptions to this statement. Constipation is the rule at first, but later on there is a great tendency to diarrhœa. A red line along the gums and transverse cracking of the teeth have been described as significant of phthisis, but they are frequently absent and are not at all characteristic.

Consumptive patients are inclined to be irritable and fretful. As a rule they are remarkably hopeful, and even when near the end cannot realize their condition, but imagine they will recover.

The urine is more or less febrile in the early stage, and contains excess of products of tissue destruction. Finally it becomes watery and deficient in solids. Albumen or sugar may be present. The menstrual functions are often imperfectly performed.

PHYSICAL SIGNS.—The *physical signs* which may be associated with phthisis are due to: 1. Primary consolidation. 2. Softening of this. 3. Cavities in the lungs. 4. Secondary consolidation from interstitial pneumonia, which tends to produce much induration and shrinking of lung-tissue. 5. Other pulmonary affections, viz., pleurisy, bronchitis, emphysema, pneumonia, hæmorrhage into the bronchi, and pneumothorax. It has been customary to divide phthisis into three stages, those of *consolidation*, *softening*, and *excavation*, but these are always more or less combined, and in addition evidences of curative changes are frequently observed. The extent over which the morbid signs are perceived varies considerably, and usually they are present in different stages over different parts of the chest. An important character in chronic phthisis, however, is, that they tend to be localized, the rule

tions. Some cases remain apparently in the same state for a long time, while others, even when far advanced, improve and may ultimately become practically cured. It is sometimes quite astonishing what a length of time patients will remain alive, when apparently in a moribund condition. Death may take place from gradual asthenia and hectic fever; hæmoptysis occasionally; some of the complications mentioned, which generally aid in the fatal result; or from some intercurrent attack.

VARIETIES.—Different writers have classified cases of phthisis, and have attempted to indicate the clinical features characteristic of each variety. It may be useful to enumerate here the chief forms, and to point out what are the supposed clinical distinctions between certain of them, though on this matter much more extended observation is required, while they often are combined or merge into each other.

The varieties may be thus arranged :

I. Acute. 1. Ordinary pneumonic. 2. Catarrhal pneumonic following bronchitis. 3. Miliary or tubercular.

II. Chronic. 1. Pneumonic. 2. Catarrhal pneumonic after bronchitis. This tends to come on insidiously, being preceded by one severe or long-continued attack of bronchial catarrh, or by several repeated attacks. The thermometer reveals more or less pyrexia. The disease is prone to be localized, slow in its progress, and under proper treatment shows a decided tendency towards cure, with contraction and induration of the affected part. 3. Hæmorrhagic. Two distinct meanings have been given to this term. Some merely imply that the disease has commenced with spitting of blood, or that this is a prominent and frequent symptom in its course; others that the hæmorrhage into the bronchi has actually set up phthisis, by exciting inflammation. 4. Fibroid. This form has already been fully considered. 5. Mechanical. Produced as the result of the constant inhalation of irritant particles, this form has several subdivisions, named according to the nature of the occupation or irritation, *e. g.*, miners', colliers', knife-grinders' phthisis; carbonaceous, cotton-phthisis, etc. The progress is slow, the morbid process being due to a combination of chronic bronchitis, catarrhal and interstitial pneumonia, though at last true tubercle may form. The expectoration contains more or less of the inhaled substances, sometimes in great abundance. Thus in carbonaceous phthisis the sputa may be perfectly black, and the lungs are often observed on post-mortem examination to be in the same condition. 6. Secondary tubercular, *i. e.*, where tubercle is added to some previous morbid condition. Niemeyer has given the following signs as suggestive of the secondary development of tubercle, but justly remarks that the diagnosis is a matter of much difficulty: Great increase in dyspnœa and frequency of respiration, without any corresponding increase in physical signs; the fever becoming of a more continued type; and symptoms of laryngeal com-

plication, intestinal ulceration, or tubercle in other parts setting in. 7. Primary tubercular. Here there is no preceding bronchial catarrh. The patient may be evidently tuberculous, and the constitution is greatly affected from the outset, pyrexia of continued type and wasting being marked symptoms. Dyspnœa is often severe, with rapid breathing, but there are no adequate physical signs. Afterwards there may be evidences of inflammatory consolidation and destruction of tissues, but not to the same extent as in other forms. Soon there are indications of laryngeal phthisis, ulceration of the bowels, tubercular peritonitis or meningitis, or other complications. The progress is generally rapid. 8. Syphilitic. I merely mention this as a possible variety of phthisis, but very little is positively known about it.

Some authorities recognize other varieties, such as scrofulous phthisis, drunkards' phthisis, etc. Among the cases which have come under my observation, none have occurred indicating any such special forms of the disease.

DIAGNOSIS.—The diagnosis of phthisis involves not only the recognition of the presence of the disease, but also as correct a knowledge as possible of its seat and extent, its stages in different parts of the lungs, and its nature and origin. These questions can only be determined by a careful consideration in each case of the history, and of the existing symptoms, both local and general; and by thorough and systematic physical examination. This subject will be considered more fully later on.

PROGNOSIS.—Those who wish for full information on this important matter will find it in the valuable work of Dr. Pollock on Consumption. The ability to form a reliable prognosis in phthisis can, however, only be acquired by much experience and observation. There is now ample evidence to prove that phthisis may in many cases undergo a complete cure, while in a large proportion its progress may be greatly delayed by appropriate treatment, and life rendered fairly comfortable. It is difficult to lay down any average duration or mortality, these varying so much under different conditions. In endeavoring to arrive at a prognosis, the chief circumstances to be taken into account are as follows: 1. *The stage, seat, and extent of the disease.* At an early period a hopeful opinion is warranted as a rule, though at the same time it should be a guarded one. When cavities have formed the prognosis is very much worse. If the disease is limited to one apex, even should there be a cavity, recovery is not unusual; but the prognosis is more serious in proportion to the extent of the mischief and the number of excavations, especially if both lungs are involved. Basic phthisis seems to be unfavorable. 2. *The progress of the local lesions.* Signs of rapid progress, either in extension of the disease or in the tendency to softening and destruction of tissues, are very unfavorable; on the other hand, if the disease is chronic or at a standstill, or if, should a cavity have formed,

there are indications that it is drying up and contracting, the prognosis is much more hopeful. Signs of considerable local consolidation and induration from interstitial pneumonia are often favorable, as showing cessation of active disease and the advance of healing processes. 3. *Origin and nature of the disease.* Tubercular phthisis is extremely serious; when it follows bronchial catarrh or is due to certain obvious external causes, from the influence of which the patient can be removed, there is a far better chance of recovery. 4. *Constitutional condition and hereditary predisposition.* Phthisis is more dangerous if the patient is feeble and delicate, but especially if there are evidences of the existence of a tubercular or scrofulous diathesis, or if there is a strong hereditary tendency to phthisis. 5. *Local symptoms.* Continued dyspnoea, harassing cough, profuse expectoration, and severe or repeated hæmoptysis are bad indications. 6. *General symptoms.* Phthisis is dangerous in proportion to the degree of fever; rapidity and weakness of pulse; debility and incapacity for exercise; emaciation and night-sweats. If the general condition shows signs of improvement, the pyrexia ceasing and flesh and weight being gained, the prospect is much more hopeful. 7. *State of the digestive organs.* Inability to take food or to digest it is a most serious drawback in phthisis. Cases in which vomiting is a prominent symptom are also exceedingly unfavorable. 8. *Diet and hygienic conditions.* Deficient or non-nutritious food and improper hygienic conditions greatly increase the evils of phthisis. This is constantly exemplified among the out-patients at Brompton Hospital. Many of those who become in-patients revive wonderfully, as the result of the improvement in their diet and surrounding circumstances. 9. *Complications.* Many of these seriously increase the gravity of the prognosis.

The question is often asked in advanced cases—How long is the patient likely to last? It is useless to attempt to give more than an approximate opinion on this point, it being so uncertain. The appearance of thrush is generally a sign of the "approach of the end." Another question refers to the effects of pregnancy. Usually this condition seems to delay the disease for a time, so far as I have observed; but after parturition it generally advances with increased rapidity. Marriage of persons decidedly phthisical should certainly be opposed.

TREATMENT.—The ultimate objects to be kept in view in the treatment of phthisis are: First, its prevention and arrest; secondly, its cure; or, failing these, thirdly, palliation of symptoms and prolongation of life. Every case requires thoughtful consideration, and it must not be imagined that this is a disease capable of being controlled by any one remedy or class of remedies. An essential part of the treatment, however, is that which has for its end the maintenance and promotion of a state of general good health and constitutional vigor.

1. *General Hygienic and Dietetic Treatment.* This is of the utmost

importance, both for prevention and cure, and without it all other measures are frequently unavailing. The chief things required under this head are a healthy residence, on a dry soil, in a suitable climate, elevated but well protected from cold winds, with pleasant scenery and sufficient vegetation; free ventilation, especially as regards the sleeping apartments; fresh air and exercise, so far as the powers of the system will permit; the avoidance of crowded places at night, and of all causes which are likely to excite pulmonary affections; the wearing of warm clothing, with flannel next the skin; the employment of cold baths, if they can be borne, with friction afterwards; the administration of as nutritious a diet as can be assimilated, which should contain a good proportion of fatty elements; and the avoidance of all injurious habits, such as intemperance or excessive venery. The question of climate will be separately considered. It is often requisite to inquire into the occupation of the patient, and to change this, should it entail long daily confinement in a close room with deficient exercise, or exposure to the exciting causes of lung diseases. At the same time the patient should, if possible, be relieved from undue mental labor or anxiety. The amount and character of the exercise to be adopted must vary in different cases, but as a rule such exercises as aid in the expansion of the chest are to be recommended, especially in young patients, though they must be kept within proper limits. Walking and riding are useful, and if these cannot be endured passive exercise is to be enjoined, the patient being driven out daily when weather permits, so that at least a proper supply of fresh air may be obtained. At the same time over-fatigue must be avoided. Certain acts which call into exercise the muscles of respiration are often beneficial if duly regulated, such as taking deep inspirations, reading aloud, or moderate singing. Anything that interferes with the freedom of the respiratory movements, as the pressure of tight stays or a bent position, ought to be forbidden. Milk is a most valuable article of diet, and some consider asses' or goats' milk specially efficacious. Whey has also been well spoken of. In many cases a little wine or beer is very beneficial.

2. In all cases where there is any fear of phthisis setting in, attention should be paid to the slightest indication of pulmonary disorder. Should the complaint be acute in its origin and of an inflammatory nature, the measures already mentioned when treating of the different forms of pulmonary inflammation must be had recourse to. Further, any acute exacerbation should receive immediate attention, but it is very important in most cases to avoid lowering measures, and to preserve the strength as much as possible, rest in bed being enjoined. Of course everything which is likely to excite irritation in connection with the lungs must be strictly guarded against.

3. Before proceeding to the active treatment of any case of phthisis, it is of the greatest consequence to look to the state of the digestive

organs. Unless digestion is carried on properly, all other measures are unavailing; and here it must be mentioned that regularity of meals and other matters upon which healthy digestion depends should receive due consideration. If any form of dyspepsia is present, the appropriate remedies must be administered. Should there be signs of gastric irritation, a combination of bismuth with an alkaline carbonate and hydrocyanic acid is very beneficial. In the early period the bowels are often confined, and some mild aperient must then be given, so that they may be opened daily.

4. Various tonic and other medicines which improve the condition of the general health and of the blood are very serviceable in phthisis. Of these the principal are the dilute mineral acids—nitric, hydrochloric, sulphuric, or phosphoric; quinine; different preparations of iron, especially if the patient is anæmic; salicin; strychnia; and vegetable bitter infusions or tinctures, such as those of gentian, calumba, chiretta, quassia, or cascarilla. These may be given in various combinations.

5. Among the many special therapeutic agents recommended for phthisis, *cod-liver oil* holds the first position. Almost universal experience has testified to its good effects in this disease. It is needless to enter here into the question of its mode of action, but certain matters of practical importance as regards its administration must be mentioned. Only a small dose should be given at first, not too often repeated. A teaspoonful once or twice a day is sufficient to commence with, the dose being increased by degrees to a tablespoonful three times daily. It is seldom desirable to exceed this quantity. Most patients take the oil best immediately or soon after meals, and if it tends to disagree, lying down for a short time after taking it will not unfrequently prevent any ill effects. Some can manage it best when going to bed at night. It is always well to make use of some vehicle for administering the oil, even when it can be taken alone, but the quantity of this should not be large. It may in many cases be given with the mixture, if this is of a bitter or acid nature; or with steel wine. Milk, orange wine, frothy stout or ale, or a little cold brandy and water, are among the most useful vehicles. When the oil repeats or causes sickness, it is often well borne when given with lime-water and milk in equal parts, some of which may also be drunk after it. Small doses of strychnine have been found very useful in preventing the nauseating effects of the oil. It is most important to look to its quality, especially at the outset, otherwise a patient may get an unsurmountable antipathy to it. Different varieties are preferred by different practitioners. A good pale oil seems to answer best generally; many patients like De Jongh's pale-brown oil very well. Regularity and perseverance in the use of the remedy are essential in order to realize the effects it is capable of producing. During its administration the diet must be carefully attended to, and should not be of too rich a character. If from time to time it appears to dis-

agree with the digestive organs, it may be temporarily omitted, especially during the warmer months. It has been recommended to introduce cod-liver oil by inunction or enema, but though necessary under some circumstances, these modes of administration are objectionable as a rule. Inunction is often advantageous in children. Several preparations containing cod-liver oil have been made, such as the etherized oil, or a combination with quinine, hypophosphite of lime, and other remedies.

Numerous substances have been advocated as substitutes for cod-liver oil, but they are far less efficacious. The chief of these are olive oil; skate, shark, or dugong oils; cocoanut oil; dogs' fat; glycerin; and cream. The last two certainly produce good effects in some cases.

Space will only permit the enumeration of some other special remedies recommended. The principal are pancreatic emulsion; hypophosphites of lime, soda, and iron; phosphate of lime; extract of malt; iodide of potassium; sulphurous acid and sulphites; arsenic; koumiss. These have been very differently reported upon by different observers, and though most of them are useful in certain cases, they are by no means to be looked upon as specific remedies.

6. *Local Treatment.*—Applications to the chest are decidedly useful in many cases, either for the relief of symptoms, the subduing of inflammatory processes, or possibly they may have an immediate effect on some forms of phthisis. The most useful are small or flying blisters; applications of iodine, more or less powerful; and liniments of croton oil, turpentine, or acetic acid. Local removal of blood is decidedly but seldom desirable. In acute exacerbations fomentations and poultices are often required. In some cases the application of strapping over parts of the chest, in order to procure mechanical rest, has a beneficial effect as regards the progress of phthisis.

7. *Treatment of Symptoms and Complications.*—Various symptoms frequently need attention during the course of a case of phthisis, but it is impossible to do more here than point out their nature, and suggest the indications for their management, most of them being considered in detail in other parts of this work. Pyrexia must be subdued, especially if it is inclined to be high. Quinine in full doses with digitalis may be given for this purpose. Dr. C. Theodore Williams has found cold baths beneficial in some cases. Debility and wasting will be counteracted by the general treatment already described, as well as by subduing the fever. When there is much exhaustion, considerable quantities of alcoholic and other stimulants are required. For night-sweats the chief remedies are oxide of zinc, gr. ij—v, in the form of pill or powder given at night; tincture of belladonna, or subcutaneous injection of atropine; or a full dose of quinine or gallic acid. In some cases I have found that the night-sweats were best checked by the administration for a few days of a mixture containing quinine, alum, and dilute sulphuric acid.

Sponging the upper part of the body carefully with vinegar and water is sometimes useful. Pains about the chest are often relieved by the local applications already mentioned, or by wearing some anodyne or warm plaster; in a large number of cases much pain in the side is complained of from time to time, either muscular or pleuritic, and this is almost invariably at once relieved by strapping the side properly, as described under pleurisy, which is the plan of treatment I always adopt under such circumstances. Cough is often a most troublesome symptom. It is by no means always desirable to stop it, but its management must be guided by the amount of expectoration, the discharge of which is to be encouraged or its amount diminished by remedies mentioned under bronchitis. In most cases cough needs to be relieved, and it is always advisable first to look to the state of the throat and larynx, as cough is very commonly due to some unhealthy condition in these parts. Local applications of tannin or chlorate of potash, or various astringent gargles or lozenges are often most beneficial. If the cough is irritable, anodynes are valuable, especially opium, morphia, codeia, hydrate of chloral, croton-chloral, bromide of ammonium, conium, belladonna, or chlorodyne, some of which may be combined. These are best given in the form of lozenges, syrups, or linctuses, and it is desirable to make all cough mixtures as small as possible. Anodyne and other inhalations are in many cases extremely serviceable, but not for any curative influence upon the disease. They are particularly useful if the larynx is affected. If the expectoration is fetid, disinfectant inhalations should be employed. Weak iodine inhalations are sometimes decidedly beneficial. Dyspnœa and hæmoptysis must be treated according to the ordinary principles. Vomiting is sometimes a very distressing symptom; if the ordinary remedies fail, small doses of strychnia should be tried, and its effects are in some cases most satisfactory. Diarrhœa, if due to ulceration of the bowels, is frequently very difficult to check. Carbonate of bismuth, gr. v—x, with Dover's powder, gr. iij—v, is often a useful combination; but enemata of starch and opium are most to be relied on. Other complications must be attended to as they arise.

8. *Change of Climate and Sea-voyages.*—This is a most important subject in connection with the treatment of phthisis, and for detailed information the reader is referred to the writings of Williams, Walshe, Henry Bennett, and others. In selecting a suitable climate, the chief points to be observed are that it is not liable to either extreme of temperature; that the air is pure and not too moist; that the soil is healthy, and that there is no likelihood of sudden changes, exposure to cold winds, or continued unfavorable weather. It is always well also to choose a place rendered attractive by bright sunshine, pretty scenery, and pleasant company. One most important object in selecting a climate is that the patient may be enabled to be out in the open air as much as possible. The salutary influence of high altitudes upon phthisis

has been well-established, and some recommend a residence in mountainous districts, even during the winter. It is questionable, however, whether this is desirable, but patients should rather reside in some warm and sheltered place during the colder months, and go to a high and dry region during the warm season. The exact qualities of the climate which are suitable for any individual case will depend upon its mode of origin, and the conditions of the bronchial mucous membrane. Those cases which are of constitutional origin are particularly benefited by a sojourn in lofty regions. The principal seaside places suitable for phthisical invalids are the Isle of Wight, especially Ventnor, Bournemouth, Torquay, Hastings, St. Leonards, Penzance, Worthing, Sidmouth, Southport, Grange, Clevedon, and Tenby, in this country, where the temperature is moderate, but moisture considerable; Mentone, Nice, San Remo, Palermo, Cannes, Malaga, Malta, or Algiers, where there is a high temperature, with but little moisture; Madeira, West Indies, and the Azores, where both temperature and moisture are considerable. Among inland regions, Pau, Pisa, Upper Egypt, Syria, Australia, and certain parts of South Africa are recommended; or if elevated districts are desired, the Alps, Andes, Himalayas, or Mexican mountain ranges afford the requisite conditions.

Long voyages, especially to Australia or up the Mediterranean, are most useful in many cases, but they should not be recommended if the disease is too far advanced.

A large number of patients are unable to avail themselves of the benefits to be derived from a suitable climate, though, thanks to the various hospitals established in many seaside places in this country, these advantages are more widely disseminated than they were formerly. If during the winter months patients are prevented by circumstances from residing in a proper climate, they should keep indoors as much as possible in bad weather; avoid every cause of cold; and wear a respirator. Men should allow the beard and mustache to grow. The treatment of consumption by mineral waters, compressed air, inhalation of oxygen, and other special methods, does not seem to have been attended with much success.

CHAPTER XV.

CANCER OF THE LUNGS.

ETIOLOGY.—This disease, which is exceedingly rare, is far most common from 40 to 60 years of age; and more males are affected than females. It may be inherited. In the large majority of cases it is sec-

ondary, especially to cancer of the bones or testicles, but may result from direct extension, or be primary in its origin. Pulmonary cancer generally extends so as to involve neighboring parts, but is very rarely followed by secondary cancerous formations in other internal organs.

ANATOMICAL CHARACTERS.—Encephaloid is the variety of cancer usually found in the lungs, and it is often extremely soft, pulpy, and vascular. Other forms are occasionally met with, alone or in combination, and considerable deposit of black pigment may be observed, constituting melanotic cancer.

Secondary cancer assumes almost always the nodular form, and affects both lungs; the nodules vary much in size, and when at the surface tend to be depressed; by their union a lung may be involved throughout. Primary cancer is particularly prone to be confined to one lung, especially the right, and is often infiltrated. After a time the cancerous matter undergoes fatty degeneration and softening, cavities being formed in some cases, and extravasations of blood into its substance are common. The vessels and bronchi are often either involved in the disease or obliterated by pressure. The unaffected portions of the lung-texture may be normal, or various morbid changes are set up. A cancerous lung feels remarkably heavy. Extensive pleuritic adhesions are usually observed.

SYMPTOMS.—Secondary cancer tends to come on insidiously without any subjective symptoms. I have seen a case in which the left lung was involved almost throughout, and the right also extensively, the only symptoms being occasional cough, with shortness of breath on exertion. In primary cancer there is usually pain in the chest, which may be extremely severe, of a lancinating character, and accompanied with tenderness. Cough is usually present, attended in some cases with a peculiar expectoration, in the form of a substance resembling red or black-currant jelly, or occasionally containing cancer elements. Hæmoptysis is very common. Dyspnœa is generally observed, being especially severe if there are projecting nodules pressing on the nerves; or if the cancer is associated with a mediastinal tumor, when there are other signs of pressure on neighboring structures.

The general symptoms are not usually so marked as might be expected. The cancerous cachexia may or may not be evident; emaciation, fever, night-sweats, and failure of strength are generally present more or less, but they may be comparatively very slight, especially in the secondary form. Wasting is sometimes extremely rapid in its progress when once established.

PHYSICAL SIGNS.—These will vary according to the form, seat, and amount of the cancerous accumulation, and whether it is associated with a mediastinal tumor or not. Where there are scattered nodules, there may only be slight alterations in the percussion and respiratory

sounds. If a lung is extensively involved with nodular cancer, being ultimately converted into a mass of encephaloid, the signs are: Enlargement of the side, with widened and flattened spaces, the surface feeling unusually even, but without any sense of fluctuation; great deficiency or entire absence of movement; weakened or annulled vocal fremitus; absolute dulness, unaltered by position, with great sense of resistance; weakened or absent breath-sounds over a variable area; deficient vocal resonance; displacement of heart or diaphragm, the cardiac sounds being frequently conducted with an unusual degree of intensity. In the infiltrated form the lung is contracted, and physical examination reveals: Retraction of the side, with depression of the intercostal spaces; deficient movement, the spaces still acting, however; increased, diminished, or absent vocal fremitus, according to the amount of consolidation; hard, wooden, high-pitched, or tubular percussion, which may extend across the middle line; bronchial, blowing, or feeble respiratory sounds; often intensified vocal resonance; displacement of the heart, either towards the affected or opposite side, with intensification of the sounds; and drawing up of the diaphragm. Ultimately there may be signs of cavities. In the non-cancerous parts signs of hypertrophy, bronchitis, emphysema, or collapse, are usually present.

PROGNOSIS is necessarily fatal, death occurring either from local or general causes.

TREATMENT can only be palliative, the usual remedies being employed for the relief of symptoms as they arise.

RARE MORBID FORMATIONS IN THE LUNGS.

It will only be necessary to enumerate certain morbid formations which may possibly be met with in the lungs, viz.: hydatids; sarcomatous, enchondromatous, osteoid, or myeloid tumors; hæmatoma.

CHAPTER XVI.

DISEASES OF THE PLEURA.

I. PLEURISY—INFLAMMATION OF THE PLEURA.

ETIOLOGY.—*Exciting causes.* These may be enumerated as: 1. Direct irritation of the pleura, from injury; foreign matters which have gained access into its cavity, *e. g.*, pus or air; local deposits in the pleura, *e. g.*, cancer, tubercle; diseased bone; friction or pressure by tumors. 2. Cold or other injurious meteorological influences, though

Local.—Acute pain is felt, usually in the infra-mammary or infra-axillary region, of a dragging, catching, or stitchlike character, increased by breathing or coughing, and attended with superficial or deep tenderness. The sharpness of the pain is often evidenced in the expression, posture, and mode of breathing of the patient. Respiration is carried on in a hurried, shallow, and irregular manner, but there is no actual dyspnoea at first, and the number of respirations is rarely above from 30 to 35. Later on there is evident dyspnoea should much fluid be poured out, which varies in its degree, being in some cases very severe. Cough is generally present, though the patient tries to repress it; it is short and hacking, generally dry, or at least unattended with any particular expectoration. Sometimes it is excited by making the patient sit up or bend forward. At first the patient usually prefers to lie on the affected side, but later on there is no uniformity, for it is not uncommon to see patients with one pleura full of fluid habitually rest on the healthy side.

General.—Pyrexia is observed, but it is not very marked, and the temperature has no typical course. The pulse is frequent, varying usually from 90 to 120, full and bounding, but deficient in resistance, as evidenced by the sphygmograph (Anstie). The pulse-respiration ratio is altered somewhat, but not to any great degree. There is very little prostration. Disturbance of the digestive organs, headache, and other symptoms associated with the febrile state are present more or less. The urine may be slightly albuminous.

COURSE AND PROGRESS.—In favorable cases the symptoms subside in a few days, and the fluid is absorbed. Should this not happen, the only remaining symptom in many cases is a little dyspnoea. Ultimately the effusion may in time be taken up or discharged through the bronchi or externally, or be removed by operation. In cases of chronic effusion pyrexia often continues, the skin being hot, dry, and harsh, and the pulse frequent but weak. The patient wastes and becomes much debilitated. (Edema of the affected side and extreme clubbing of the finger ends are sometimes noticed. *Fistulous empyæma* is generally attended with great weakness, loss of flesh, and a tendency to hectic fever. The hair frequently falls off. Ultimately symptoms of tuberculosis may arise. The formation of pus has been supposed to be indicated by repeated rigors, but certainly this is not always the case. Perforation into the bronchi is attended with profuse expectoration of matter. Should extensive adhesions form, with retraction of the side, more or less shortness of breath remains, with a liability to pains on the side affected, and more or less debility.

It is very important to notice that extensive effusion may be poured out without there being any symptoms to draw attention to the chest—*latent pleurisy*; and this is especially liable to happen in secondary pleurisy, or when the complaint occurs in children. *Bilateral pleurisy*

is necessarily a serious condition, and is attended with dangerous dyspnœa. *Diaphragmatic pleurisy* probably gives rise to very severe pain; and also interferes greatly with breathing.

PHYSICAL SIGNS.—In the early stage of pleurisy the only reliable physical signs are: 1. Diminished movements on the affected side, on account of pain. 2. Friction-fremitus, which is exceedingly rare. 3. Friction-sound, at first slight and grazing, but becoming much louder when lymph is formed. It may be limited to a small spot; or be heard extensively over the side.

The signs attending the stage of fluid effusion are usually quite characteristic, being, however, considerably modified by its quantity and mode of accumulation. Usually the evidences of effusion are first observed over the lower part of the chest, and extend upwards more or less rapidly. 1. The side is enlarged to a variable degree, and the spaces are often specially affected, being either flattened or bulged out. It is important to make use of the cyrtometer in determining this enlargement, as the measurement may be actually less on the affected than on the healthy side. 2. Movement is diminished or almost completely annulled. 3. Vocal fremitus is deficient or absent below, in excess above; there being frequently an abrupt transition from the one condition to the other, particularly in front. 4. Fluctuation may occasionally be detected. 5. Percussion-sound is dull over the area of the fluid. Beginning below, the dullness may ultimately extend over the whole side, and beyond the middle line for some distance. If the patient has assumed the recumbent posture at an early period, dullness is sometimes noticed over the whole of the back before any is observed in front. It may be movable with a change of posture of the patient, but frequently this is not the case. In many instances an abnormally clear or tubular sound can be elicited under the clavicle at a certain stage, and the transition from dullness may be quite abrupt; occasionally the percussion here simulates cracked-pot sound. 6. Breath-sounds are absent or feeble below; exaggerated or even blowing or tubular above. 7. Friction-sound may or may not be heard at the margin of the dullness. 8. Vocal resonance is diminished or annulled below, increased above, the change being often marked. *Ægophony* is frequently heard, especially about the angle of the scapula. 9. Displacement of organs is an important sign, especially of the heart. Its impulse may be noticed far over on the right side in cases of left pleurisy, and its sounds are very loud here. The impulse, however, is probably connected with the right ventricle. The diaphragm, with the liver, spleen, or stomach, may also be depressed. Some cases have come under my notice in which a cardiac murmur seemed to be due to displacement. 10. Rarely succussion gives rise to a splashing sensation or sound, owing to the presence of air in the pleura.

Absorption may be traced by the gradual subsidence of the signs

described, and their restoration to the normal, often accompanied with a loud redux friction-sound, and sometimes with friction-fremitus. Dulness may continue for some time. In favorable cases the side resumes its proper form and size, and the lung expands. The heart occasionally remains in its abnormal position, owing to adhesions; or goes too far in the opposite direction; or lies more or less loose in the chest. Should the lung remain unexpanded the signs are: 1. General retraction of the side, the ribs being crowded together; the shoulder lowered; all the diameters of the chest diminished, especially the antero-posterior; and the spine curved, usually to the diseased, occasionally to the healthy side. 2. Movements null or greatly lessened. 3. Deficient resonance. 4. Feeble respiratory sounds over the side generally; or in some parts of bronchial quality. Fistulous empyæma is followed by extreme retraction of the side.

The signs of fluid are now and then observed on both sides. On the other hand they are limited in the "loculated" variety of pleurisy, which may cause local bulging. The fluid sometimes makes its way to the surface, and even points like an abscess; or in rare instances exhibits pulsation when in the neighborhood of the heart. Should an empyæma open into the bronchi, râles will be heard over the lung, and sometimes pneumothorax is produced. In diaphragmatic pleurisy there may be no signs except cessation of all abdominal movements during respiration.

In children some important modifications of the ordinary physical signs are noticed. The chest being very yielding, is dilated considerably and at a very early period, while the organs are comparatively less displaced. Bronchial breathing and vocal resonance often persist even when the thorax is full of fluid.

Old adhesions resulting from previous attacks may influence the signs of pleurisy considerably, as well as lung-consolidations.

TERMINATIONS.—1. Recovery takes place in a large proportion of cases of pleurisy, after absorption or removal by operation of any fluid, the lung expanding fairly, but being more or less adherent. 2. Death is a rare event in acute cases, unless the pleurisy is bilateral or associated with some serious constitutional or local disease. It may happen, however, from the mere mechanical effects of fluid effusion, accompanied with pulmonary congestion and œdema, and there is a danger of sudden death should there be great dyspnœa. 3. Transition into chronic pleurisy is not uncommonly observed. Under this would be included—*a.* Chronic effusion. *b.* Retraction of the side from extensive adhesions, with permanent binding down of the lung. *c.* Chronic purulent discharge, either by an external opening; through the air-passages; or in some unusual direction, such as into the intestines. In these cases the patient may ultimately either sink from gradual

asthenia or become phthisical; or sometimes recovery follows, though with permanent loss of the use of the lung on the affected side.

DIAGNOSIS.—This subject will be again considered, and here it need only be mentioned that pleurisy has not merely to be distinguished from other affections of the lung or pleura, but that it may be simulated at first by painful affections of the chest-wall; or in the stage of fluid effusion by enlargements of the liver or spleen, hydatids of the liver, or a large tumor within the chest. Careful physical examination has mainly to be relied upon in diagnosis.

PROGNOSIS.—This involves not only the immediate result of the disease, but also its ultimate issue. Primary pleurisy ought to terminate favorably in the great majority of cases, if properly managed. It is more serious in proportion to the amount of fluid poured out; the time it has remained in the pleura; and its tendency to become purulent. Severe dyspnoea is a dangerous sign. The thermometer and sphygmograph may be of use in aiding towards a prognosis. Pleurisy secondary to constitutional diseases is very grave; also when it occurs in advanced cases of chronic alcoholism. Bilateral pleurisy with effusion is necessarily most dangerous. The different forms of chronic pleurisy are often unfavorable. Discharge of pleuritic fluid through the lungs is generally a most untoward termination, but I have known some cases do remarkably well after this event. It must be remembered that when pus forms or caseous degeneration is proceeding, there is a danger of tuberculosis being set up.

TREATMENT.—The activity of the measures to be adopted in the management of pleurisy must differ greatly in different cases, and I strongly protest against any routine practice of removing blood, blistering, and administering mercury in this disease, which, whatever may be said to the contrary, is even at the present day by no means an uncommon mode of practice. The ultimate objects to be kept in view are not merely to save the patient's life, but to restore the parts affected to as normal a condition as possible.

The principles to be kept in view in the treatment of pleurisy are:

1. To subdue the inflammation and diminish the amount of lymph and fluid poured out.
2. To promote the absorption of these materials as rapidly as possible.
3. To remove them in some other way if they cannot be absorbed.
4. To relieve symptoms.
5. To support the strength of the patient.

1. The first thing which is attended to in the treatment of inflammation of synovial, as well as of most serous membranes, is to keep the structures affected in as complete a state of rest as can be obtained. It appears to me that this should also be the primary measure to be kept in view in the management of pleurisy. For some years I have been in the habit of paying special attention to this matter, by mechanically fixing the side affected, and thus limiting or preventing its movements,

and am firmly convinced of the beneficial effects resulting therefrom. The following is the method which I now adopt for the purpose of procuring the desired rest: Strips of a properly-adherent plaster spread on some thick material, from three to four inches wide and of sufficient length, are applied round the affected side from mid-spine to mid-sternum or a little beyond. These are laid on over a variable extent of the chest, according to the requirements of the case, it being sometimes necessary to include the whole side. It is best to make the application from below upwards, and to fix the strips of plaster in an oblique direction rather than horizontally. The patient being directed to expire deeply, a strip is fixed at mid-spine and drawn tightly, firmly, and evenly round the side in the direction of the ribs, *i. e.*, a little obliquely from above downwards and forwards; then another strip is laid on over this, also extending from mid-spine to mid-sternum, but in the opposite direction to the first, *i. e.*, obliquely upwards and forwards across the course of the ribs; the third is to follow the direction of the first, overlapping about half its width, the fourth that of the second, and so on in alternate directions, until the entire side is included if required. Finally it is often desirable to apply over the whole two or three strips horizontally, so as to form a superficial layer, and one or two may also be passed from behind forwards over the shoulder, these being kept down by another fixed round the side across their ends. The good effects realized by this method of treatment, when efficiently carried out, have been these: 1. In cases of limited dry pleurisy, which are very common, especially in phthisis, as well as exceedingly distressing, it gives almost invariably complete and immediate relief, so that patients can breathe and cough comfortably, and are able to follow their occupations without discomfort, which is particularly important in the case of those who are obliged to work. 2. It is reasonable to suppose that the quantity of inflammatory products poured out will be limited by this condition of rest. I have every reason to conclude that this result was realized in several instances. 3. The rest and pressure may also aid absorption, and I have found this mode of treatment decidedly efficacious in the removal of moderate pleuritic effusion. 4. Occasionally cases of pleurisy come under observation, in which there is extensive exudation of lymph with little or no fluid, and this remains as a chronic condition, causing palpable fremitus, attended with most unpleasant sensations. The only curative end that can be attained is to bring about adhesion of the surfaces of the pleura, and strapping the chest will most certainly effect this purpose.

Venesection or even local bleeding is, in my opinion, scarcely ever required in pleurisy. Calomel is a drug which had better be avoided, except as an aperient. Many cases require nothing but rest, but if the attack is severe, the best therapeutic agents at the outset are those which lower the cardiac action, such as aconite, veratrum, or tartar

emetic in small doses, which may be given in some saline mixture. Opium is most valuable for the purpose of relieving pain and procuring sleep, Dover's powder being a very useful form for administering it; or morphia may be injected subcutaneously. The application of cold to the chest has been recommended.

2. Should there be much effusion—and this is not unfrequently the state of things when the patient comes under observation—free counter-irritation over the chest is decidedly beneficial, by means of repeated large blisters, or the application of iodine liniment. I have met with several instances in which strapping the side has certainly appeared to aid absorption, when the fluid was not in large quantity. Medicines which act on the skin, bowels, or kidneys, are those which are supposed to be most efficient in promoting absorption. Full doses of iodide of potassium with infusion of digitalis and other diuretics are sometimes beneficial. Powerful purgatives are of questionable value, and should be employed with caution if at all, but the bowels should be kept freely opened. Repeated vapor or hot-air baths have proved serviceable in some instances under my care. Dr. Anstie strongly recommended tincture of iron, and this is certainly a valuable remedy in many cases.

3. A most important mode of treating many cases of pleuritic effusion consists in the removal of the fluid by *paracentesis thoracis*. Formerly this was regarded as merely a last resource; now it ought to be looked upon as a legitimate and most valuable method of treatment. Many questions connected with this subject are still matters of dispute, such as the time at and circumstances under which the operation ought to be performed; the instrument to be employed; the amount of fluid to be removed; and whether it is dangerous or not to allow the entrance of air into the pleura. There is ample evidence to prove the great value of paracentesis, even in acute cases, especially in the treatment of children, and I can add my personal testimony in favor of this measure. In the late Dr. Anstie's excellent article on Pleurisy, in *Reynolds's System of Medicine*, the circumstances under which paracentesis ought to be performed are summed up as follows: 1. In all cases of pleurisy, at whatever date, where the fluid is so copious as to fill one pleura, and begins to compress the lung of the other side. 2. In all cases of double pleurisy, when the total fluid may be said to occupy a space equal to half the united dimensions of the two pleural cavities. 3. In all cases where, the effusion being large, there have been one or more fits of orthopnea. 4. In all cases where the fluid can be suspected to be pus, an exploratory puncture must be made; if purulent, the fluid must be let out. 5. In all cases where a pleuritic effusion occupying as much as half of one pleural cavity has existed so long as one month, and shows no sign of progressive absorption.

Ordinarily the fluid is best taken away by means of the aspirateur. In exceptional cases the trocar must be employed. It is not neces-

sary to remove the whole of the fluid, provided it is not purulent. It is probably safer to exclude air, if possible. If a fistulous opening remains, and fetid pus escapes, the cavity of the pleura should be washed out from time to time with lukewarm water, which may contain some disinfectant, such as a little carbolic acid, or tincture of iodine (1 part to 4).

4. The chief symptom likely to call for special attention is pain in the side. If not relieved by rest, the best plan is to employ subcutaneous injection of morphia. If the side is not strapped, hot fomentations, linseed-meal poultices, or sinapisms may be tried. Urgent dyspnœa calls for paracentesis usually. Cough must be relieved, if troublesome, by sedative remedies.

5. Patients suffering from pleurisy need not be kept low as regards diet, but stimulants are not to be given at first. If the strength fails, and especially in the different chronic conditions, abundant nutritious food is required, with wine or beer. Quinine, mineral acids, cod-liver oil, and other remedies of this kind are also very useful at this time.

6. The treatment of secondary pleurisy must be guided by the condition with which it is associated. Lowering measures are especially to be avoided in these cases.

II. HYDROTHORAX—DROPSY OF THE PLEURA.

ETIOLOGY.—Hydrothorax is almost always a part of general dropsy from cardiac or renal disease. It is said to be in rare instances of an active kind, associated with cancer or tubercle.

ANATOMICAL CHARACTERS.—More or less clear serous fluid is found in both pleural sacs, compressing the lungs. There are none of the signs of inflammation.

SYMPTOMS.—Dyspnœa, with signs of deficient blood-aeration, are the only symptoms of this condition, resulting from mechanical interference with the action of the lungs, and there is generally much distress, because hydrothorax is added to some previous serious affection, and because both sides are involved. The *physical signs* are those of fluid in both pleuræ; not excessive in amount; freely movable; without friction-sound or fremitus; there being no displacement of the heart.

TREATMENT.—As a rule this is merely a part of the general treatment for dropsy. Dry cupping over the chest might be employed. In extreme cases paracentesis might be indicated, in order to afford temporary relief.

III. HÆMOTHORAX—HÆMORRHAGE INTO THE PLEURA.

ETIOLOGY.—More or less blood may be mixed with pleuritic effusion of inflammatory origin; or with the ordinary serum, should there be a scorbutic or purpuric tendency. The accumulation of blood in any

quantity in the pleura is due to one of the following causes: 1. Rupture of a vessel from injury, or its perforation during operation. 2. Bursting of an aneurism, of which I have seen a most interesting example, in which an aneurism of the aorta between the pillars of the diaphragm ruptured into the left pleural cavity. 3. Carcinoma of the lung giving way into the pleura. 4. Diffuse pulmonary hæmorrhage extending to the surface. 5. Cancer of the pleura itself.

SYMPTOMS.—There is dyspnœa, owing to the pressure of the blood upon the lung, with evidences of loss of blood. Death may occur very speedily. The *physical signs* are merely those of pleuritic accumulation, either liquid or solid.

TREATMENT.—In most non-traumatic cases nothing can be done but to keep the patient at rest. Of course if the bleeding is due to injury it is necessary to try to stop it. Paracentesis may possibly be required.

IV. PNEUMOTHORAX—HYDRO-PNEUMOTHORAX.

ETIOLOGY.—1. Pneumothorax of any clinical importance results in the great majority of cases from perforation of the lung, owing to the rupture of a phthisical cavity. In very rare cases the lung gives way in the earlier stages of phthisis, or in connection with emphysema, abscess, gangrene, hydatids, or cancer; or the vesicles rupture from violent cough, especially hooping-cough; or a collection of air or blood under the pleura perforates the latter. 2. Perforation may take place from the pleura into the lung, in connection with empyæma or abscess of the chest-walls. 3. Injury may lead to pneumothorax, viz., direct perforation from without, fractured ribs, or severe contusion. 4. The stomach or œsophagus has been known to rupture into the pleura. It is unnecessary to consider those cases in which gas is present from the decomposition of fluid.

ANATOMICAL CHARACTERS.—The gas generally consists of oxygen, carbonic anhydride, and nitrogen in variable proportions, with, under some circumstances, fetid ingredients, such as sulphuretted hydrogen. It may fill the pleural sac completely, compressing the lung; or is sometimes limited by adhesions. It tends to excite inflammation, the resulting effusion being either serous or purulent.

SYMPTOMS.—It is only necessary to consider those which are indicative of perforative pneumothorax. Usually a sudden, very intense pain in the side is experienced; as well as occasionally a sensation of something giving way, and of fluid pouring out; followed by urgent dyspnœa and signs of shock. These symptoms frequently immediately follow a violent cough. The dyspnœa may temporarily diminish, or steadily increases in proportion to the amount of air accumulated, until constant or paroxysmal orthopnœa is established. The voice becomes feeble, in some cases to complete aphonia. Cough is often

rendered difficult and ineffectual, and expectoration ceases. Occasionally there is much hyperæsthesia of the side. The pulse is frequent, weak, and small, but breathing being hurried out of proportion, the pulse-respiration ratio is altered. The patient generally presents an anxious and distressed aspect, and soon evidences of apnœa are apparent. A common mode of decumbency at first is dorsal, with the head raised and the body inclined to the sound side; or the patient may assume a kneeling posture, supported on the elbows. In many cases the posture is changed frequently, and when fluid collects there is a tendency to lie on the affected side.

It must be borne in mind that even in severe cases the symptoms may be by no means marked; and, when the escape of air is limited by adhesions, they are usually comparatively slight.

PHYSICAL SIGNS.—The amount of air accumulated; the presence and quantity of fluid mixed with it; and the patency or closure, as well as the size, of the perforation into the lung, will modify the physical signs of pneumothorax. 1. The side is enlarged, often to an extreme degree, the spaces being widened and effaced, or even bulged out, so that the surface of the chest feels smooth. 2. Movements are deficient or annulled. 3. Vocal fremitus is weak or absent. 4. Percussion reveals at first increased resonance, the sound being often typically tympanitic, and this may be noticed considerably across the middle line. Sometimes it has an amphoric quality. If the amount of air is extreme, there is dulness with much resistance. When effusion of fluid takes place, dulness will be observed in dependent parts, movable with change of posture usually. Occasionally at the line of junction of fluid and air an amphoric note can be elicited, with a quivering sensation to the fingers. 5. Respiration-sounds may be weak and distant, or almost suppressed; typically amphoric when the fistula is open, with a metallic echo; or alternately one or the other. A whistling inspiration is heard in rare instances, due to the passage of air through a narrow chink. 6. Vocal resonance may be feeble or absent; or exaggerated, with a metallic or amphoric echo; while the whisper in some cases is very loud, and has a marked metallic character. 7. Cough may also have a metallic echo. 8. Metallic tinkling is sometimes distinctly produced by breathing, coughing, or speaking; and the bell-sound may be elicited. 9. Succussion gives rise to a splashing sensation and sound, if both air and fluid are present. 10. The mediastinum, heart, diaphragm, and abdominal organs are displaced to a variable degree. 11. The heart-sounds are now and then intensified on the affected side, and attended with a metallic echo.

PROGNOSIS.—Though a very grave event, pneumothorax is not necessarily fatal, recovery occasionally taking place. It is less dangerous if localized. In some instances where it has occurred during phthisis, it seems to have delayed the progress of the lung-disease.

TREATMENT.—I have found great relief in some cases from strapping the side firmly, as described under pleurisy. If the amount of air is considerable, causing urgent dyspnoea, paracentesis must be performed, and pressure may be afterwards applied. Dry cupping of the chest is sometimes useful. Stimulants and antispasmodics should be given to counteract shock and dyspnoea. Dr. Walshe recommends repeated inhalations of small quantities of chloroform. Pleurisy must be treated should it arise.

CHAPTER XVII.

GENERAL DIAGNOSIS OF AFFECTIONS OF THE LUNGS AND PLEURÆ.

IN this chapter it is intended to bring together the chief pulmonary diseases which resemble each other, and point out their diagnostic marks. In many cases they can only be severally distinguished by a full consideration of the history of the patient; local and general symptoms; and physical signs present.

1. **ACUTE PULMONARY AFFECTIONS.**—The characteristic features of the principal diseases belonging to this group are indicated in the table on page 462.

It is impossible in an arrangement like that in the table to do more than indicate in a general way the main differences between the ordinary diseases. It must be remembered that non-typical cases are met with, and that these affections are often presented in various combinations. Usually the chief matters as regards diagnosis are to distinguish bronchitis from pneumonia, especially catarrhal pneumonia complicating bronchitis; basic pneumonia from pleurisy; acute phthisis from either form of pneumonia or extensive bronchitis; and the different varieties of this disease from each other.

The diagnosis of pulmonary congestion and its consequences, abscess, and gangrene, have been sufficiently indicated in the descriptions of these morbid conditions. It is often difficult to diagnose between mere lobular collapse and lobular pneumonia, but the thermometer will afford important aid in distinguishing them.

2. Occasionally a case comes under observation where one side is enlarged, and there is a doubt as to whether the physical signs are due to fluid or to very extensive solid accumulation, especially secondary cancer of the lung. Under such circumstances the diagnosis must be founded on: *a.* The history of the case. *b.* Certain physical signs,

DIAGNOSTIC TABLE OF ACUTE PULMONARY DISEASES.

	Bronchitis.	Croupous Pneumonia.	Catarrhal Pneumonia.	Pleurisy.	Acute Phthisis.
1. Mode of invasion.	Coryza, and other symptoms of "cold." Not marked rigors, but only slight and repeated chills, if any.	A single, severe, prolonged rigor.	Generally after bronchitis or collapse, and without distinct rigors.	Several moderate rigors or slight chills, if any; may be very insidious.	Follows pneumonia, bronchitis, or catarrhal pneumonia, or begins with severe rigors, often repeated.
2. Sensations about the chest.	Soreness, heat, or rawness behind the sternum. Muscular pains from cough.	Pain in the side frequently, not stitchlike, but more dull and diffused.	Pains about the chest often, but not specially localized.	Severe stitchlike pains in side.	Generally pains in various parts of the chest.
3. Cough.	In paroxysms, often severe.	Considerable, and in paroxysms.	Short, hacking, and painful.	Slight, and patient tries to repress it.	Frequent and violent fits.
4. Expectoration.	Abundant, and changes its characters as the case progresses, from mucous to muco-purulent, etc.	Considerable, viscid, tenacious, and "rusty."	Often less than before, not "rusty."	Absent or very slight, and of no special characters.	Abundant, either bronchitic, or sometimes "rusty," or attended with hæmoptysis.
5. Disturbance of breathing.	Sense of dyspnoea in proportion to the extent of the disease, may be extreme. Pulse respiration ratio not proportionately altered.	Very rapid breathing, and much perversion of pulse respiration ratio, but not proportionate feeling of dyspnoea.	Rapidity of breathing increased when the complaint follows bronchitis, but feeling of dyspnoea may be less.	Quick shallow breathing at first, but less disturbance of pulse respiration ratio than in pneumonia. Later on more or less actual dyspnoea.	Great dyspnoea, and very hurried breathing, especially in the tubercular form.
6. Degree of pyrexia.	Often absent or slight, and temperature rarely above 100° to 102°. Skin moist.	Considerable; temperature usually high, 103°, 104°, 105°, or more, and runs a regular course. Skin acridly hot and dry.	Temperature high, but there are considerable remissions and irregular intervals.	Not great, and no regularity in course of temperature. Skin not acridly hot.	Often very high, especially in the tubercular form, but no regularity in temperature.
7. Aspect of the patient and general condition.	Tendency to cyanosis if the disease is extensive, some cases adynamic symptoms.	Marked flushing of face, often unilateral. Not cyanotic. Usually great prostration.	Face is flushed often much anxiety and restlessness, with loss of flesh and strength.	Nothing special particular prostration or tendency to cyanosis.	Severe prostration and weakness, with profuse perspiration and rapid wasting in the tubercular form extreme adynamia.
8. Physical signs.	Various dry and moist râles and rhonchal fremitus. Signs of obstruction of the bronchial tubes. More or less bilateral.	At first crepitant rhonchus, followed by signs of consolidation, viz., diminished movement, increased vocal fremitus, dulness bronchial or tubular breathing increased and metallic vocal resonance, finally signs of resolution. Usually one base is affected. The side is not notably enlarged, nor is there displacement of organs.	There may be signs of consolidation in scattered spots, with râles. Both lungs are usually involved in irregularly scattered patches. When the disease follows extensive collapse, there may be a peculiar pyramidal form of dulness.	At first friction sound or fremitus, succeeded by signs of fluid, viz., side often enlarged, movements interfered with, diminished vocal fremitus, dulness, occasionally movable, weak or suppressed breathing and vocal resonance, ægophony sometimes, displacement of organs, finally, signs of absorption, with reduplication-sound or fremitus. Usually on one side.	At first merely signs of bronchitis, followed by consolidation, softening, or excavations in different parts, especially the base. In the tubercular form there is frequently nothing but scattered râles.
9. Course and termination.	Variable. No crisis. Tendency to death by apnoea or adynamia in capillary bronchitis.	Often a marked crisis, and ends within a certain period.	No crisis, and course often prolonged.	No crisis, and course very variable.	Generally very rapid course, and fatal termination.

viz.: in consolidation the chest is uneven on its surface; there is no fluctuation, but a marked sense of resistance on percussion; as a rule, also, there is bronchial breathing, with increased vocal resonance and conduction of the heart-sounds, though there may be complete absence of breath-sounds and voice, except, perhaps, in certain spots, such as close to the spine. *c.* The symptoms present, and general condition. In consolidation there are frequently pressure-symptoms; more severe cough, with expectoration; and the sputa may have special characters, hæmoptysis being also not uncommon. If there is any actual uncertainty recourse must be had to the employment of the aspirateur or a small exploratory suction-trocar, by means of which some fluid, if present, may be removed for examination, and no damage is done if there is none.

3. There are certain conditions in which signs of increase of air within the chest is observed, viz., emphysema; hypertrophy of the lung, and pneumothorax. There may be some difficulty in separating the two former, and they are often more or less associated. Hypertrophy is generally unilateral, following some affection which evidently interferes with the action of the opposite lung; while the breath-sounds are simply exaggerated; and there are no symptoms. Emphysema is usually bilateral; expiration and its sound are much prolonged; dry râles are often heard; and there is characteristic dyspnœa. The mode and conditions of onset; severity and nature of the symptoms; almost invariably unilateral character; great enlargement of side, with typical tympanitic percussion-sound, amphoric breathing, and other physical signs, render the diagnosis of pneumothorax from the other affections mentioned perfectly easy as a rule.

4. Perhaps as difficult a matter as any in the diagnosis of lung affections is to distinguish between certain morbid conditions, which are attended with retraction of one side, viz., chronic interstitial pneumonia; retraction after pleurisy; certain cases of ordinary phthisis; collapse of the lung, and infiltrated cancer. It will be only practicable here to indicate the main points to be attended to, which are: *a.* The previous and family history of the case in all its details, and not least its duration. *b.* The local symptoms, especially the presence and character of pain, and the nature of the sputa, which should be carefully examined, the occurrence of hæmoptysis, and the characters of any blood expectorated, being points of much importance. *c.* The constitutional and general condition, as indicating tuberculosis or cancer, emaciation, debility, or pyrexia. *d.* The presence of signs of tubercle or cancer in other parts. *e.* The physical signs noted, including their characters; their seat, as to the part of the lung affected, and whether one or both, and their extent. Chronic pneumonia, cancer, and phthisis are often attended with signs of cavities, these being in the last affection usually most marked at the apex, but not so in the others. In

cancer, dulness frequently extends across the middle line. It is important to make thorough examination for the presence of a tumor in the chest, which might, by causing pressure on a bronchus, lead to collapse; and also to look for other signs of pressure, which are generally associated with cancer. *f.* The progress and duration of the case, which will usually help considerably when there is any obscurity.

5. Sometimes there is a difficulty in distinguishing between chronic bronchitis and phthisis, when the former is attended with profuse purulent expectoration and wasting. The slow progress and comparatively slight degree of emaciation; absence of fever; non-occurrence of hæmoptysis; and absence of physical signs of consolidation followed by cavities, will serve to characterize mere bronchitis in the majority of cases, but it must be borne in mind that it may end in phthisis. For the diagnosis of the different forms of phthisis from each other, which is often difficult, reference must be made to what has been said in alluding to its varieties.

6. It may be necessary to determine the nature of any fluid in the pleura, and the cause of its presence, and here it must be mentioned that fluid may find its way from the abdomen, as from an abscess of the liver or kidney bursting through the diaphragm. There will then have been previous symptoms indicative of these conditions. With regard to the determination of the nature of the fluid in cases of pleuritic effusion after inflammation, it is impossible to come to any positive conclusion without making use of the aspirateur or exploring trocar, and obtaining some of it for examination. Mere hydrothorax is distinguished from inflammatory effusion by the following characters: *a.* It is usually a part of general dropsy. *b.* Fluid is found on both sides, but not in excessive quantity; accumulates in the lower part of the pleuræ, pushing down the diaphragm, but not displacing the mediastinum and heart as a rule; and is freely movable. *c.* There are no friction phenomena. *d.* Pain and tenderness are absent, but dyspnoea is generally very severe. *e.* There is no pyrexia. Hæmothorax is characterized by the circumstances under which it occurs; and signs of loss of blood. If there is any uncertainty the aspirateur should be employed.

7. It must be mentioned that symptoms and physical signs may be observed in connection with the lungs due to certain morbid conditions not originally associated with these organs, such as rupture of hydatids of the liver or hepatic abscess into the lung, hernia of the stomach through the diaphragm, and other exceptional lesions.

CHAPTER XVIII.

DISEASES OF THE CIRCULATORY ORGANS.

I. CLINICAL PHENOMENA CONNECTED WITH THE HEART.

THE evidences of disease in connection with the central organ for the circulation of the blood are necessarily not confined to this part alone, but must be more or less apparent throughout the entire system. It is essential to notice, however, at the outset, that most grave organic cardiac mischief may be present without there being any evident symptoms to indicate this; and, on the other hand, apparently serious disturbance of the heart may be observed, which is entirely functional. Further, other diseases are often associated with cardiac affections, especially renal and pulmonary, which may greatly modify the symptoms.

1. Various subjective sensations are often experienced about the cardiac region, viz., pain, oppression, dragging, sinking, or unpleasant sensations associated with the movements of the heart, such as palpitation, irregularity, jogging, rolling, falling back, jumping into the throat, intermittency, or complete stoppage. These are sometimes attended with extreme distress and dread of death. There may be tenderness; or, on the other hand, relief from pressure.

2. The action of the heart is frequently disturbed, being feeble almost to cessation, excited, palpitating, irregular, or intermittent.

3. Symptoms may result from excessive action of the heart, especially about the head and face, such as dull heavy headache, with sense of fulness and rushing of blood; throbbing sensations; giddiness; noises in the ears; flashes and specks before the eyes; flushing of the face; or heat of head. In short there are the signs of active congestion, which may even terminate in rupture of the vessels of the brain, or epistaxis. When the right ventricle is acting unduly, symptoms of active congestion of the lungs arise.

4. On the other hand, deficient cardiac action gives rise to special symptoms, due to an insufficient supply of arterial blood, viz., those of actual syncope; or attacks of an apoplectic or epileptiform character; or merely a state of habitual want of vigor and incapacity for any exertion, with coldness and clamminess, especially of the extremities, pallor, and a tendency to faintness.

5. A most important series of phenomena in cardiac diseases result from mechanical interference with the circulation of the blood, in consequence of which the pulmonary or general venous system or both become overloaded, this being also associated commonly with imperfect oxygenation of the blood and deficient supply to the arteries, the latter causing a more or less marked anæmic appearance. When the pulmonary circulation is involved, bronchial catarrh, pulmonary congestion, œdema, or even hæmorrhage may result, attended with the usual symptoms. Long-continued congestion will lead to thickening or atheromatous or calcareous degeneration of the pulmonary vessels; proliferation of cellular tissue in the lungs, with excessive formation of pigment; or emphysema. It is necessary to allude to the characters of ordinary *cardiac dyspnoea* or *cardiac asthma*. It resembles that of exertion, being more or less hurried, panting or gasping, and noisy. It is subject to much variation, being liable to come on in very severe paroxysms, breathing being quite free and undisturbed in the intervals, the fits occurring particularly

after any effort, especially ascending heights, or when the patient lies down or falls asleep. The act of respiration is not interfered with, hence it is not very frequent, nor is expiration prolonged as in emphysema, and the respiratory movements and sounds are quite free. Of course if the lungs are involved the characters of the breathing will be modified accordingly, and true bronchial asthma may be observed. A peculiar disturbance of respiration has been described by Cheyne in fatty disease, in which the act becomes gradually hurried and deeper up to a certain point, and then subsides by degrees until at last there is a momentary cessation of breathing and dead silence. Involuntary sighing is occasionally observed.

When the general venous system is obstructed, the various tissues and organs of the body become mechanically congested, and the consequences of this stagnation follow, viz., serous effusion; permanent enlargement of capillaries; increase of connective tissue, with thickening and contraction; or rupture of vessels, with hæmorrhage. It is necessary to consider in some detail the symptoms resulting from these morbid conditions: *a.* As the result of the general venous plethora, the patient presents a more or less cyanotic appearance, especially about the lips, fingers, and toes; with pallor, from deficient supply of arterial blood. In time the face becomes puffy and bloated, and the finger ends clubbed. The patient feels chilly, and is deficient in vitality and vigor, being disinclined for any exertion, languid, apathetic, and easily fatigued. Sooner or later dropsy sets in, usually beginning in the feet and ankles and extending upwards, ending in general anasarca with serous effusions. As a rule it is gradual in its onset, and often subsides temporarily under appropriate treatment; in some instances, however, it is rather rapid in its appearance, and then relief may follow as regards chest symptoms. If general cardiac dropsy comes on rapidly, it is usually more easily got rid of and less likely to return soon, than when it is gradual in its progress. In connection with the venous congestion and dropsy cutaneous lesions are liable to be set up in the legs, viz., erythema, erysipelas, eczema, rupture of the skin, sloughing, or chronic ulceration. *b.* Some very striking symptoms are due to the disturbance of the circulation in the central nervous system. These are dull, heavy headache; sensations of giddiness and unsteadiness; sleepiness, sleep, however, being disturbed by startings and most unpleasant dreams; mental obscurcation, with irritability, want of resolution and stability, indisposition to mental effort, and impairment of the intellectual powers generally; disturbances of vision and hearing, there being also in time objective changes in connection with the eyes; curious sensations or twitchings in the extremities. Ultimately gradual sopor ending in complete coma may set in; or apoplexy or ventricular effusion may occur. *c.* The digestive and assimilative organs also readily suffer in most cases. The tongue becomes full, large, congested, and marked with the teeth; the mouth and throat being also often the seat of venous congestion. The stomach becomes the seat of catarrh with increased secretion of mucus, leading to dyspepsia, sensation of fulness in the epigastrium, flatulence, eructations, and deficient or depraved appetite. From intestinal congestion results constipation, diarrhœa, or an alternation of these symptoms; and in course of time hæmorrhoids are originated. The liver is at first congested and enlarged, and a certain amount of jaundice is often evident, this being partly due to congestion of the mucous membrane lining the bile-ducts. The bile also is liable to be unhealthy, owing to an admixture of mucus from the gall-bladder, and this increases the difficulty of digestion. Ultimately the liver may become the seat of a form of cirrhosis. After a time the spleen tends to become permanently enlarged. *d.* Undoubtedly the kidneys may be involved, becoming congested and probably finally cirrhotic; hence at first the urine is deficient in quantity, dark, concentrated, and of high specific gravity, deposits urates, and

contains more or less albumen, as well as casts in some cases. There may be pain and tenderness over the renal region. Catarrh of the bladder occasionally occurs.

e. From congestion of the genital organs symptoms commonly arise in females, viz., menorrhagia, metrorrhagia, leucorrhœa, and possibly metritis. In males there is a diminution in sexual power and inclination; while prostatic enlargement and hydrocele have been supposed to be occasionally due to cardiac affections.

6. Very dangerous symptoms may arise in connection with heart disease, from the formation of clots and other matters in its cavities, portions of which are also liable to be conveyed into the circulation as emboli, inducing local symptoms, associated with obstructed arteries, or giving rise to general contamination of blood.

7. In exceptional instances certain conditions of the heart or pericardium may originate symptoms by causing pressure on neighboring structures.

8. Cardiac affections will necessarily influence materially the state of the pulse, from which most important information may be gained. In all cases, therefore, the pulse ought to be thoroughly investigated in all the particulars to be presently described; and it is requisite also to examine carefully in order to determine whether the arteries are in a condition of degeneration or not.

9. In rare instances dangerous symptoms result from rupture of the heart, and consequent escape of blood.

II. CLINICAL PHENOMENA CONNECTED WITH ARTERIES.

1. Occasionally there may be pain, throbbing, tension, or other sensations associated directly with some diseased condition of an artery; and tenderness is not uncommon.

2. Pressure on neighboring structures gives rise to an important class of symptoms in connection with aneurismal dilatation of arteries. Only aneurisms in the chest or abdomen, however, come specially under the notice of the physician. At present the symptoms due to pressure within the chest will alone be considered. They may result from the pressure of any mediastinal tumor, and therefore the description here given will apply to all forms of mediastinal enlargement, it being borne in mind that the exact symptoms present must necessarily depend upon the situation, shape, size, direction and rate of growth, and other characters of the tumor; that it is rare for the whole of those mentioned to be observed in the same case; and that they are liable to change, owing to an alteration in the direction of growth or other causes. The modes in which pressure contributes to the production of symptoms may be summed up generally as follows: *a.* By causing displacement, as of the heart, trachea, or large vessels; and altering the relation of orifices. *b.* By pressing upon hollow tubes or organs, and obstructing them to a greater or less degree, *e. g.*, the air-tubes, œsophagus, great vessels, thoracic duct, heart. *c.* By compressing the substance of organs, and thus preventing them from performing their functions, *e. g.*, the lungs. *d.* By leading to actual destruction of tissues, as of the chest-walls, spinal cord, walls of hollow tubes, pericardium of heart, lungs, nerves. *e.* By irritating or paralyzing nerves, symptoms being often thus set up at a distance from the seat of mischief. *f.* By exciting local inflammation, ending in exudation, adhesions, or suppuration.

Such being the general effects of pressure, the special symptoms may be considered according as the pressure tends in an outward or *centrifugal*, or an inward or *centripetal* direction.

(i.) *Centrifugal Symptoms.*—In addition to obvious physical signs, pressure on the parietes of the thorax will excite pain, either neuralgic; or due to inflammation of various structures; or to destruction of bone, when it tends to be heavy,

grinding, and gnawing. When neuralgic, the pain often shoots in various directions, as up along the neck or down the arm. There may be merely a sense of weight and oppression, or heat, or indefinable feelings. Tenderness is frequently observed and sometimes extreme hyperæsthesia. Actual paralysis of nerves may ultimately be caused. If the vertebral column is eaten through, symptoms associated with the spinal cord are set up, first indicative of irritation, and subsequently of destruction.

(ii.) *Centripetal Symptoms*.—*a.* Pressure on the right side of the heart or pulmonary artery will interfere with the supply of blood to the lungs, and thus aid in causing dyspnœa, while it leads to general overloading of the venous system. The action of the heart is very liable to be disturbed when it is pressed upon. *b.* Obstruction of the main arteries—innominate, carotid, or subclavian—will alter the characters of the corresponding carotid or radial pulse, diminishing its fulness and force, or delaying it. *c.* Most important symptoms result from pressure on the large systemic veins, usually the superior vena cava, either innominate, or the vena azygos major. Very rarely is the inferior cava interfered with. Venous congestion, œdema, enlargement of capillaries and veins, the formation of coagula, or actual rupture follows, the nature and extent of the symptoms necessarily depending upon the vein which is obstructed, being usually confined to the head, face, neck, chest, and arms, and either bilateral or unilateral. The face, especially the lips, is often puffed and livid, presenting distended capillaries. The neck may be full, thickened, and tumid-looking, having a peculiar spongy or elastic feel, somewhat resembling that of erectile tissue. The throat is often congested and forms much secretion. More or less severe cerebral symptoms result from the venous congestion of the brain, and deafness is sometimes complained of. If the vena azygos is pressed upon, there are signs of spinal congestion, viz., sensory and motor disturbances in the lower part of the body. Should the inferior cava be interfered with, there will be anasarca of the legs and abdominal walls, accompanied with ascites and other signs of obstruction in the abdominal circulation. *d.* Rarely the pulmonary veins are compressed, causing pulmonary congestion and its consequences. *e.* The various morbid conditions set up in connection with the main air-tubes or lungs will cause more or less severe dyspnœa, cough, hæmoptysis, alterations in voice, and other symptoms. Frequently marked laryngeal symptoms are present, either due to direct pressure; chronic laryngitis and ulceration, which may be the result of mere irritation of the nerves; or functional nervous disturbance. When hæmoptysis occurs, the blood sometimes resembles “currant jelly.” *f.* From œsophageal obstruction dysphagia may result; and if food cannot be taken, emaciation necessarily follows. Rarely hæmatemesis takes place. *g.* Extreme emaciation is said to be the consequence of obstruction of the thoracic duct. *h.* Pressure on nerves originates numerous phenomena, some of which have been already noticed. Interference with the vagus nerves or pulmonary plexuses disturbs breathing and cardiac action. The recurrent nerves, especially the left, are peculiarly liable to be pressed upon, severe laryngeal symptoms and dysphagia being thus produced. Pressure on the phrenic nerve will affect the action of the diaphragm. Diminution in the size of the pupil of the eye, or, more rarely, dilatation, depends upon more or less disturbance of the sympathetic; this also may affect the temperature and nutrition of one side of the head and face. Some of the nerves forming the brachial plexus are in exceptional instances so pressed upon as to lead to paralysis of the arm; and pressure on the intercostal nerves may cause paralysis of the corresponding muscles.

I may be allowed to digress here to draw attention to the absolute necessity of an intelligent knowledge with regard to the medical anatomy of the thoracic contents,

as well as of the functions of the various structures, before the symptoms due to pressure can be at all comprehended.

3. Obstruction of an artery will be followed by symptoms dependent upon the want of a proper supply of arterial blood in the part to which the obstructed vessel normally conveys it. These will vary not only with the organ or part which is thus deprived, but also according to the degree and rapidity of obstruction. If sudden and complete, it will lead to immediate cessation of functions, and thus may induce serious symptoms, as in the case of the brain, in connection with which sudden loss of consciousness and hemiplegia may follow obstruction of an artery; or when the main artery of a limb is blocked up, which is followed by local paralysis. If more gradual, it causes anæmia, diminution of temperature, depression of functions, and deficient nutrition, which may end in softening or actual gangrene. The pulse also is more or less weakened to complete extinction in the arteries which receive their blood from that which is obstructed; while in the portion of this nearer the heart there is increased pulsation.

4. Diseased conditions of arteries may originate emboli or substances which contaminate the blood, thus giving rise to symptoms of obstruction in other parts, or to general symptoms indicating septicæmia.

5. Serious phenomena, both local and general, will necessarily attend the rupture of an artery, if it is of any size.

6. *The Pulse.*—To feel the pulse has always been justly looked upon as one of the first duties of a medical practitioner. This gives invaluable information in general diseases and various affections connected with other organs which influence the heart and vessels; as well as with regard to their own special morbid conditions. The subject will be considered under *physical examination*.

III. CLINICAL PHENOMENA CONNECTED WITH THE VEINS.

1. There may be pain, tenderness, or cutaneous redness in the course of veins.
2. When veins are obstructed in any way, local formation of clots being the most frequent cause, there will be the signs already described, varying in extent and situation according to the vein involved. 3. Emboli may originate from clots in veins, and be conveyed to various parts of the body.

IV. PHYSICAL EXAMINATION OF THE CIRCULATORY ORGANS.

The chief modes of physical examination applicable for the investigation of the circulatory system are similar to those already described in connection with the lungs. In addition, two special instruments are employed, viz., the *sphygmograph* and *cardiograph*. The latter has scarcely been used as yet to an extent sufficient to make it available for ordinary practice; the former is an important instrument, and will call for more detailed consideration.

The nature of the information afforded by the different modes of examination in connection with the heart and vessels may be thus summarized. *Inspection* reveals: 1. Any alteration in the shape and size of the chest over the cardiac region; or any bulging corresponding to an aneurism. 2. Certain points about the impulse of the heart. 3. The amount of visible pulsation in the great arteries of the neck; the existence of abnormal pulsation; and certain conditions of the arteries

of the limbs. 4. The state of the superficial veins, as well as of the large veins in the neck, especially the right external jugular. *Palpitation* indicates: 1. Any local change in size and shape. 2. The precise characters of the cardiac impulse. 3. The presence of any cardiac thrill or pericardial friction-fremitus. 4. The condition of the large arteries of the neck; the characters of any abnormal pulsation, whether visible or not; and the state of the arteries of the limbs. 5. Certain points about the veins of the neck. *Mensuration* merely gives more accurate information with regard to form and size. *Percussion* discloses: 1. Any alteration affecting the cardiac dullness; and the amount of resistance felt over this region. 2. Abnormal dullness due to an aneurism. *Auscultation* is mainly useful for investigating certain sounds, viz.: 1. Sounds connected with the heart. (i.) The ordinary cardiac sounds. (ii.) Abnormal sounds originating within the heart, named *endocardial murmurs*, usually depending upon some morbid condition in connection with the orifices and valves. (iii.) *Pericardial murmurs* or *friction-sounds*, due to roughness of the surfaces of the pericardium. 2. *Arterial sounds* and *murmurs*, especially in the large arteries of the chest and neck, but which may be observed in the smaller arteries. 3. *Venous murmurs*. It may be mentioned that the stethoscope is also very serviceable for realizing certain characters of the cardiac impulse or of an aneurismal pulsation, through the sensations thus conveyed to the head.

I proceed now to consider the physical examination of the several parts of the circulatory system.

A. EXAMINATION OF THE HEART.

I. CHANGES IN THE FORM AND SIZE OF THE CARDIAC REGION.

1. *Bulging*. This may extend from the second to the seventh rib, and the sternum may be partly involved. The intercostal spaces are either normal or prominent. Measurement shows that there is a greater distance from the nipple to midsternum on the left than on the right side. Bulging is most liable to occur in young persons. *Causes*. (i.) Enlargement of the heart, especially hypertrophy. (ii.) Pericardial effusion.

2. *Depression*. There may be a general falling in over the cardiac region; or the spaces are chiefly affected. *Cause*. Pericardial agglutination, with adhesion to the chest-wall.

II. CARDIAC IMPULSE.

The cardiac impulse is investigated by inspection, palpation, and in some cases by applying the stethoscope. In health it is usually felt in the fifth left interspace, about $1\frac{1}{2}$ inch below and $\frac{3}{4}$ inch inside the nipple,

over an area of about an inch. It is single and systolic in time; slightly heaving and gliding down towards the left; gradual and not abrupt in its development.

IMPULSE IN DISEASE.—When examining the cardiac impulse, the chief points to be noticed are: 1. Its exact position, and whether this varies with different beats of the heart. 2. Its area as seen and felt; and if it is well defined or not. 3. Its force. 4. The characters it presents to the touch. 5. Its rhythm. 6. The effects of change of posture upon it.

1. *Position.* The impulse may be displaced by conditions external to the heart; morbid changes in the pericardium; alterations in the size of the heart itself; or a combination of these. (i.) *Elevation.* The apex-beat is often raised to the fourth space or higher. *Causes.* *a.* Pushing up of the heart by some abdominal accumulation, such as ascites or an enlarged liver. *b.* Upward traction, owing to diminution in the bulk of the lung from contraction of a cavity in the left apex, or to a less extent in the right, with the formation of adhesions. *c.* Pericardial effusion and subsequent adhesion. *d.* Diminution in the size of the heart from atrophy or great loss of blood. (ii.) *Depression.* The impulse is often lowered, and may reach as low as the seventh or eighth rib. *Causes.* *a.* Cardiac enlargements, especially hypertrophy, either general, or affecting the left side. *b.* An aneurism or other tumor above the heart, pushing it down. *c.* Pericardial effusion in some cases. *d.* Weakness of the great vessels, owing to some acute or long-continued illness, allowing the heart to fall down. (iii.) *Lateral displacement,* either to the right or left, is very common, being often combined with elevation or lowering. *Causes.* *a.* Pushing aside of the heart by a collection of fluid or gas in either pleural cavity, especially the left; an enlarged lung, from emphysema, hypertrophy, or cancer; or an aneurism or other tumor. *b.* Cardiac enlargements. According to the nature of the enlargement and the part of the heart affected, the impulse will be carried more to one side or the other. As a rule it may be said that hypertrophy tends to displace it towards the left; dilatation towards the right. *c.* Pericardial effusion, which always carries the apex-beat to the left. (iv.) Occasionally the impulse alters its position with each beat of the heart, when this organ is greatly dilated.

2. *Area and degree of definition.* (i.) The area of the cardiac impulse is often increased to a variable extent, being either well defined or the reverse. *Causes.* *a.* Cardiac enlargements, especially if associated with pericardial agglutination. *b.* Excited action of the heart. *c.* Undue contact of the heart with the chest-walls, either from retraction of the left lung, adhesion between the pericardium and costal pleura; pressure posteriorly by an enlarged liver or spleen or a tumor or falling-in of the chest-walls. *d.* Pericardial effusion, in which the impulse appears to be very extensive and ill-defined. (ii.) *Diminished area is*

observed in most of the conditions which weaken the impulse, but it is not of much practical importance.

3. *Force.* This may be (i.) *Increased.* *Causes.* a. Hypertrophy of the heart. b. Too close contact with the chest-walls. c. Excited action. (ii.) *Diminished*, sometimes to complete extinction. *Causes.* a. Functional weak action of the heart from any cause. b. Certain cardiac diseases, viz., dilatation, fatty degeneration or infiltration, atrophy. c. Fluid or air in the pericardial sac. d. Distension of the lungs, especially the left, from emphysema or hypertrophy, which then come between the heart and the chest-walls.

4. *Characters.* The impulse often presents unusual characters, the following being the most important: (i.) *Undulatory or wave-like.* This may be only visible, or felt as well. *Causes.* a. Pericardial effusion. b. Dilatation of the heart, with thin, weak, and degenerate walls. c. Uncovering of the heart, with adhesions to the chest-walls. (ii.) *Heaving or pushing.* It is for the purpose of observing this character that the stethoscope is useful, through which the movement becomes often very obvious, both to the auscultator and to bystanders. A distinctly heaving impulse is characteristic of cardiac hypertrophy. (iii.) In dilatation the impulse is often quick, sharp, and slapping. (iv.) When the heart is very feeble the action may be jerking or fluttering. (v.) If pericardial agglutination exists along with hypertrophy or dilatation and valvular disease, the impulse frequently acquires very peculiar characters, differing in different cases, and there may be even a recession rather than an impulse.

5. *Rhythm.* (i.) *Irregularity* is often observed, both as regards force and time; or the beat may be *intermittent.* *Causes.* a. Functional disturbance of the heart's action. b. Cardiac diseases, viz., great dilatation, fatty disease, and some cases of mitral or aortic regurgitation with enlargement of the left ventricle. c. Malformation of the heart. d. Occasionally pericardial effusion or adhesions. (ii.) In pericardial effusion the impulse sometimes seems to lag behind the ventricular systole, as if it took some time to be conveyed to the surface. (iii.) The systolic impulse may be *double or treble*; or a *diastolic* impulse may likewise be present. This is observed in some instances of dilatation and hypertrophy with adhesions.

6. *Effects of change of posture.* (i.) *Increased mobility of the apex.* beat has been considered a sign of pericardial effusion, but it is not of much importance. (ii.) The fact that it *does not alter in different postures* is sometimes of much aid in determining the existence of adhesions—pericardial and pleuritic.

It is necessary to allude briefly to the impulse not uncommonly seen towards the base of the heart; and to that in the epigastrium. Basic impulse is observed in many cases where a cavity in the apex of the left lung has contracted, drawing up the heart and bringing it into close

contact with the chest-walls, adhesions probably forming; it may be due to excessive hypertrophy about the base, or aneurism of the heart. Epigastric impulse is generally cardiac; sometimes it is the result of aortic pulsation; or, it is believed, of regurgitation into the inferior vena cava. The cardiac epigastric impulse is either due to displacement of the heart or enlargement of the right ventricle; or it may be the natural consequence of a short thorax.

III. PECULIAR SENSATIONS FELT OVER THE CARDIAC REGION.

1. *Thrill or Purring Tremor.* These terms sufficiently indicate the character of a peculiar vibratory sensation conveyed to the fingers, which is indicative of certain conditions of the orifices and valves of the heart. In order to determine the origin of a thrill, it is necessary to observe its situation and synchronism. It may be requisite to excite the heart by brisk movement before it can be felt. The different thrills which may be met with are as follows: (i.) At the left apex—*a.* Systolic, indicating mitral regurgitation, especially if accompanied with hypertrophy. *b.* Præsystolic, associated with mitral obstruction. (ii.) Systolic in the second right interspace near the sternum, due to aortic obstruction. (iii.) Diastolic, felt down the sternum, occasionally observed in connection with aortic regurgitation. (iv.) Very rarely systolic in inner part of second left space or opposite the third cartilage, indicative of pulmonary obstruction. (v.) Præsystolic in fourth left space or opposite the fourth cartilage. This is a mere curiosity, but has been said to accompany tricuspid obstruction.

2. *Pericardial friction-fremitus* is very exceptionally observed in pericarditis. Differing in its characters entirely from thrill, it gives the impression of being quite superficial and rubbing; is movable and irregular as regards its size and rhythm, though usually felt chiefly during the systole, and seldom lasts for any length of time. It may be simulated by pleuritic fremitus caused by the action of the heart.

IV. CARDIAC PERCUSSION.

CARDIAC DULNESS.—This is described as being *superficial* and *deep*. The former corresponds to the part of the heart uncovered by lung, and is triangular in shape, bounded to the right by a line along the middle of the sternum from the fourth cartilage, and to the left by a line extending obliquely from the same point to the apex. The deep cardiac dulness extends as far as the limits of the heart, but it is exceedingly difficult to mark it out, and this cannot be done without much practice.

CARDIAC DULNESS IN DISEASE.—The points requisite to be noticed are: 1. Position. 2. Extent and directions of increase. 3. Shape. 4. Degree and quality. 5. Effects of change of posture.

1. *Position.* This may be entirely abnormal, as, for instance, when the heart is displaced to the right by pleuritic effusion.

2. *Extent and directions of increase.* (i.) The area of cardiac dulness may be *increased* more or less, this being usually associated with some change in shape. *Causes.* *a.* Abnormal contact of the heart with the chest-walls, especially when due to retraction of the lung. *b.* Enlargement of the heart, the extent and direction depending upon the part of the heart involved and the nature of the enlargement. *c.* Accumulation of blood in the cavities or walls of the heart, especially as the result of some pulmonary obstruction. *d.* Liquid or solid collection within the pericardium, but especially effusion from inflammation, the dulness then increasing in an upward direction; and excess of fat. *e.* Increase of cardiac dulness may be simulated by conditions external to the heart, *e. g.*, consolidation of the margin of the lung, accumulation of fat, a solid tumor, or aneurism of the aorta. (ii.) *Diminution* in cardiac dulness is not reliable in determining the condition of the heart, but is most useful as indicating distension of the lungs, especially the left. *Causes.* *a.* Atrophy of the heart. *b.* Great loss of blood and consequent emptiness of the cavities. *c.* Accumulation of air in the pericardium. *d.* Hypertrophy or emphysema of the lungs.

3. *Shape.* The form of the cardiac dulness often affords important indications as to the cause of any increase in its extent. In pericardial effusion it tends to be triangular, with the base down and the apex upwards. In hypertrophy it becomes elongated vertically; in dilatation lateral enlargement takes place, especially towards the right, and the shape is square or circular. The form, however, will be modified, according to the part of the heart involved, and the degree in which the two conditions are combined.

4. *Degree and quality.* The degree of dulness sometimes affords a distinction between pericardial effusion and cardiac enlargement, it being more marked in the former. If the pericardium or heart is calcified, the percussion-note may become somewhat osteal in quality.

5. With *change of posture* the dulness due to pericardial effusion may be made to alter in extent and form.

RESISTANCE.—The sensation conveyed to the fingers on percussion are not very reliable in the diagnosis of cardiac affections, but the sense of resistance is likely to be more marked in pericardial effusion than in hypertrophy.

V. AUSCULTATION OF THE HEART.

(A.) *Sounds of the Heart.*

It is essential to have a clear comprehension of the mode of action of the heart and of the sounds associated therewith, before auscultation can be of any value in the investigation of its morbid conditions. With

regard to the sounds, it is requisite to know the characters of each, how these differ as examination is made over different parts of the thorax, and their modes of production.

During each action of the heart, on listening at the apex there may be noticed in succession: 1. A systolic sound, synchronous with the contraction of the ventricles. 2. A short silence. 3. A diastolic sound at the moment when the ventricles cease to contract, and the aortic and pulmonary valves close. 4. A longer silence, which is again followed by the systolic sound. As regards time, they bear about the following proportion to each other, dividing an entire cardiac action into tenths:

Syst. sound.	1st interval.	Diast. sound.	2d interval.
$\frac{4}{10}$	$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$

At the left apex, *i. e.*, just within and below the nipple, the systolic sound is prolonged and well defined, much accentuated, seems muffled and rather deep, and of rather low pitch. The diastolic is much shorter, sharper, and more abrupt; clearer, more superficial, and higher pitched. At the right apex, *i. e.*, over the base of the ensiform cartilage, both sounds are clearer and higher pitched than at the left, and the systolic is less accentuated, shorter, and sharper. Comparing the sounds at the base and apex, it will be found that at the base the diastolic sound becomes the more marked. It is loud and distinct, much accentuated, clear, and often ringing; while systolic sound is dull and indefinite, shorter, and without any accent. At the right base, *i. e.*, opposite the second space or third cartilage close to the sternum, the sounds are usually louder than at the corresponding point on the left side, especially the diastolic. Finally it must be noticed that the sounds are generally better heard under the left clavicle and over the left side posteriorly than over the corresponding regions on the right side. It is now generally recognized that the systolic sound is due chiefly to the tension of the mitral and tricuspid valves and the muscular contraction of the ventricles; while the diastolic results from tension of the aortic and pulmonary valves.

In auscultating the heart in order to detect abnormal conditions, it may be necessary to make the patient stop breathing for a moment, and it is often advisable to excite the heart by a little brisk movement. In order to compare the sounds at the base and apex, some authorities recommend the use of a double stethoscope, so that they may be heard simultaneously, but the ordinary instrument answers perfectly well.

HEART-SOUNDS IN DISEASE.—It is highly important to attend to the ordinary cardiac sounds when investigating for morbid conditions, as they frequently afford most valuable information.

EXAMINATION OF THE SOUNDS AT THE LEFT APEX.—The stethoscope should first be applied over the apex-beat, and the following are the deviations from the normal which may be met with:

1. *Changes in intensity and apparent depth.* (i.) *The intensity may be increased. Causes.* (a.) Excited action of the heart from any cause. (b.) Approximation of the heart to the chest-walls, when the sounds also appear to be superficial. (c.) Combined hypertrophy and dilatation, particularly if the valves are somewhat hypertrophied at the same time. (d.) Deficient quantity or a watery condition of the blood. (ii.) *Diminished. Causes.* (a.) Feeble action of the heart. (b.) Certain organic cardiac affections, viz., atrophy; simple or concentric hypertrophy; dilatation with thinning of the walls; changes in the muscular walls, especially fatty disease, but also softening associated with fevers, and fibroid or cancerous infiltration. (c.) Collection of fluid, air, or much solid material in the pericardial sac. (d.) Distension of the left lung by emphysema or hypertrophy. In the last two conditions the sounds appear to be deep, in consequence of imperfectly conducting materials intervening between the heart and the parietes of the chest.

2. The *pitch, quality, and degree of clearness* of the *systolic sound* may give important information as to the condition of the valves and walls of the heart; and also as to the quality of the blood. In marked hypertrophy without dilatation, the sound becomes toneless, dull, obscure, and of very low pitch. In dilated hypertrophy with some thickening of the valves it may be clanging or musical. When the heart is merely dilated it is often high-pitched, abrupt, and clicking or slapping. Anæmia frequently causes the systolic sound to become unusually sharp, clear, and high-pitched.

3. It is important to notice the *length of the systolic sound*; and to *compare the relative lengths of the sounds and intervals*. For instance, in dilated hypertrophy the systolic sound is very prolonged; there may be hardly any diastolic sound; and the intervals are shortened. In mere dilatation the diastolic sound often becomes the longer one, so as to simulate the systolic, which is much shortened. The first sound is also very short and abrupt in mitral obstructive disease.

COMPARISON OF THE SOUNDS IN DIFFERENT PARTS OF THE CHEST.—It is often of advantage to compare the sounds over different parts of the thorax, but especially at the apex and base of the heart; and at the right and left apex or base. As illustrations of the knowledge thus to be gained the following are important: 1. If the sounds, being weak at the apex, are louder at the base, this serves to distinguish pericardial effusion from dilatation or fatty heart. 2. Greater intensity at the right apex than the left either shows displacement of the heart; or that it is covered by some imperfectly conducting material, especially an emphysematous lung. 3. Louder sounds at the left base than the right, especially the diastolic, indicate that there is some disease affecting the passage of blood through the mitral orifice, so that the pulmonary circulation is overloaded and the pulmonary artery distended. 4. Any condition, either in connection with the heart itself or external to it, which

alters the position of this organ, will correspondingly modify the sounds. For example, in left pleuritic effusion they are transferred to the right side of the chest. 5. The extent and direction of conduction of the sounds may be useful in determining disease in other organs. Thus, in consolidation at the apex of the right lung they are very often louder under the right clavicle than the left. In right basic pneumonia they are frequently very marked over the affected part. Cavities in the lungs may intensify the sounds considerably, or sometimes impart to them unusual characters, such as hollowness or a metallic quality.

REDUPLICATION.—By this is meant a doubling of either sound. It is frequently observed, even in health, and does not as a rule indicate cardiac disease. Its cause is a want of synchronism in the action of the two sides of the heart. It may be observed with either or both sounds; and at the apex or base. Without care a reduplicated sound is liable to be mistaken for a murmur.

(B.) *Endocardial Murmurs.*

An endocardial murmur is usually associated with one of the cardiac orifices, being either one of the ordinary sounds altered in its characters; or altogether a new sound. In order to determine the origin and cause of any murmur, it is necessary to observe: 1. The seat of its greatest intensity. 2. The directions in which it is conducted. 3. Its time, whether systolic, diastolic, præ systolic, or post-diastolic. 4. These being the essential characters, it is always advisable, however, to attend to other particulars, especially the duration, loudness, quality, and pitch of a murmur; and its effect upon the ordinary sounds. Thus a tolerably accurate conclusion may be arrived at with regard to the actual conditions of the valves and orifices upon which the murmur depends; the state of the heart's walls, and the manner in which this organ is acting; and the quality of the blood.

GENERAL OUTLINE OF CAUSES OF MURMURS.—1. In the large majority of cases a murmur depends upon some morbid condition in connection with one of the cardiac orifices, which either causes *obstruction* to the onward passage of the blood, or permits *regurgitation* owing to imperfect closure of the valves. (i.) *Obstruction* may arise from: *a.* Constriction at or about an orifice, its margins being generally thickened at the same time. *b.* Some direct impediment, as from greatly enlarged and nodulated or adherent valves, which cannot fall back. *c.* External pressure by a tumor, fibrous thickening, or other condition, or by the stethoscope. *d.* Twisting of an orifice, with a wrong direction of the current of blood, owing to displacement of the heart. (ii.) *Regurgitation* may be due to: *a.* Mere enlargement of an orifice, the valves not widening in proportion. *b.* Organic changes in the valves, which prevent them from performing their functions properly, such as ac-

tual destruction or rupture, perforation, great contraction, thickening and rigidity, or adhesion to the walls of the heart. *c.* Organic changes in the appendages of the valves, viz., the chordæ tendinæ or muscoli papillares, interfering with their closure. *d.* Mere irregular action or altered position of the muscoli papillares, which prevents the valves from falling into their places at the proper time or in the proper manner. *e.* Degeneration at the root of one of the great arteries, interfering with the adaptation of its valves. 2. Mere roughness of the endocardium may cause a murmur, especially when due to endocarditis, and particularly if in the vicinity of an orifice. 3. Fibrinous coagula among the columnæ carneæ or upon the surface of the valves occasionally give rise to a murmur. 4. Cardiac murmurs may depend upon certain rare morbid conditions, viz., sacculated aneurism of the heart; abnormal communication between the cavities of the heart, or between either of these and one of the great vessels; or dilatation of the aorta at its commencement, the orifice being unaltered. 5. An abnormal condition of the blood may cause a murmur, *e. g.*, anæmia. 6. Excited cardiac action is liable to render the sounds rough and murmur-like. Murmurs have been appropriately divided into *organic* and *inorganic*, according as they are associated or not with positive organic mischief. The latter will be presently alluded to separately.

CHARACTERS OF MURMURS AT EACH ORIFICE.—Theoretically there may be two murmurs in connection with each of the four chief orifices of the heart, one indicating *obstruction*, the other *regurgitation*, but only *mitral* and *aortic* murmurs are usually met with, those associated with the *tricuspid* and *pulmonary* orifices being very exceptional.

I. MITRAL MURMURS.—These are loudest over or just above the apex-beat, being conducted more or less round the side in the direction of the left axilla, and to a variable extent upwards towards the base. 1. *Regurgitant*. Systolic in time, this murmur is generally of medium or low pitch, but varies much in its other characters; it may be so loud as to be heard extensively over the chest, but is not often distinct at the base of the heart, and in many cases becomes abruptly fainter on passing the stethoscope in this direction. It is commonly perceptible behind in the left vertebral groove, or even in the right, especially opposite the sixth to the ninth dorsal vertebræ. 2. *Obstructive or constrictive*. Usually this murmur is post-diastolic or præ-systolic, being entirely a new sound, and having no connection with the diastolic sound. In some cases, however, it seems to begin almost simultaneously with this sound, and to continue through the entire interval. Its explanation is as follows: As soon as the ventricle ceases to contract the mitral valves fall back and the orifice becomes patent. The blood which has collected in the auricle quietly passes through for awhile, but finally the auricle, being distended, suddenly contracts, and drives on the blood with some force, this being immediately followed by the

ventricular systole. It is at the time of this contraction that the murmur is usually perceived, and hence it is sometimes called "auriculo-systolic." If, however, there is great constriction with much thickening and roughness about the opening, it may be heard during the whole of the period that the blood is passing through. Hence the length of this murmur varies, but it is usually rather short. Its intensity is rarely very great, but even when loud the extent of its conduction towards the axilla is much less than that of regurgitant murmur, while it is only very exceptionally heard in the back. It seems, however, to be more conducted towards the right apex. The pitch is low, and quality almost always harsh, sometimes very much so, being almost grating. It is followed by a short and sharp systolic sound. Dr. Barclay has argued that this murmur really indicates regurgitation and not obstruction.

II. AORTIC MURMURS.—1. *Obstructive*. Most marked at the base of the heart, generally over the sternum and in the contiguous portion of the second right space, aortic obstructive murmur is conducted mainly upwards and to the right, but also to some extent down along the sternum and towards the left apex, though it is not often heard there. Behind it is audible in the left vertebral groove, usually from about the second or third to the sixth or seventh dorsal vertebra, but sometimes is heard all along the dorsal region and even on the right side. I have met with several instances in which the murmur was so loud as to be heard over the chest and back extensively, as well as for a considerable distance along the arteries. It is generally prolonged and of moderate pitch, occasionally musical. 2. *Regurgitant*. This murmur is usually loudest over the sternum, opposite the third space or fourth cartilage, being conducted chiefly downwards along the sternum, so that it is very distinct at its lower end, where it generally abruptly ceases. Towards the apex and the right infraclavicular region it is not nearly so well conducted as the obstructive murmur, and it is very rarely heard in the back. Its rhythm is diastolic, it being in fact an altered second sound, but the murmur is always prolonged more or less into the interval, and may fill it completely. Indeed its duration is often so great as to lead to its being mistaken by the inexperienced for a systolic murmur, even when both exist together. Commonly it is of blowing quality, not harsh, and of medium or high pitch; but its characters are variable.

III. TRICUSPID MURMURS.—These are described as being heard at the right apex, *i.e.*, over the junction of the xiphoid cartilage and sternum, and to be conducted a little upwards and to either side. 1. *Regurgitant*. Regurgitation is common at the tricuspid orifice, but as this is due to mere enlargement of the opening, there being no roughness or thickening of the valves, and as the right ventricle does not act powerfully, a murmur is only rarely heard. When present, it is systolic,

faint, and of low pitch. 2. *Obstructive*. This is a mere curiosity, but theoretically it would be præ systolic in time.

IV. PULMONARY ARTERY MURMURS.—These are audible at the left base, about the second space and third cartilage or space near the sternum, and are conducted upwards and to the left, so as to be heard under the left clavicle. As in the case of the aorta, two murmurs may be met with, viz., 1. *Obstructive or systolic*. 2. *Regurgitant or diastolic*. Of the former several instances have come under my notice; the latter is extremely rare.

CONDITIONS INFLUENCING MURMURS.—Without entering into particulars, it must suffice to state that murmurs may be modified as regards their intensity, seat, direction of conduction, and other characters by: 1. Deformities of the chest. 2. Posture. 3. Morbid conditions external to the heart, *e. g.*, emphysema, pleuritic effusion, lung-consolidation. 4. The state of the walls and cavities of the heart, as regards hypertrophy, dilatation, or degeneration. 5. The force and regularity of the cardiac action. 6. The presence of two murmurs at the same orifice. 7. The existence of two synchronous murmurs at different orifices.

INORGANIC MURMURS.—A brief summary may be given here of the inorganic cardiac murmurs which may be met with. 1. *Anæmic*. This has usually the characters of a faint pulmonary systolic murmur, somewhat blowing or whiffing in quality. It may, however, be aortic, and some have even localized it in the tricuspid or mitral orifice. Excited action of the heart, pressure with the stethoscope, and the erect posture intensify it. The chief theories of its causation are that it is due entirely to the abnormal state of the blood, to pressure upon the vessel by the stethoscope, or to unusual vibration of the walls of the artery or its valves, in consequence of their relaxed condition. Probably all these aid in its production. 2. Murmur resulting from irregular action of the muscoli papillares in the left ventricle. Of the nature of a slight but inconstant mitral regurgitant murmur, this is usually associated with chorea, but may depend upon a very feeble or irregularly-acting heart. 3. Excited cardiac action or irregular palpitation, especially if associated with enlargement of the heart, may cause the first sound to become rough and murmur-like, particularly at the base. 4. Twisting of the heart may give rise to a basic systolic murmur. 5. External pressure generally leads to an aortic obstructive murmur, but occasionally it is pulmonary. 6. Murmurs due to clots in the heart are usually systolic, and connected with the right side.

(C.) *Pericardial Murmurs or Friction-Sounds.*

A friction-sound is often produced during the cardiac action by the rubbing together of roughened surfaces of the pericardium. The

roughness may be due to excessive vascularization, exudation or its remains, coagulated blood, tubercle or cancer.

CHARACTERS.—In the following description of a *pericardial friction-sound*, the differences between it and an *endocardial murmur* will be evident. 1. Its seat and extent are very variable, depending upon those of the physical conditions necessary for its production, but frequently its point of greatest intensity does not correspond to that of any endocardial murmur; while it is usually abruptly limited even when loud, and is not conducted in the directions of endocardial sounds. 2. It appears distinctly superficial, as a rule. 3. Great variety is observed as regards the intensity, quality, and pitch of a friction-sound. Usually it is more or less rubbing and rough in quality, but may be clicking, creaking, or grating, and Walshe describes churning and continuous rumbling varieties, due to the presence of fluid. It may differ over different parts of the heart. 4. The rhythm may be systolic, diastolic, or both, but very often it is irregular, not corresponding exactly to either, and varying with each beat of the heart. A double murmur of maximum intensity at the same spot is considered very characteristic of pericardial origin. In many cases the heart-sounds may be heard quite distinctly through the friction. 5. Pressure with the stethoscope frequently materially modifies a pericardial murmur, by increasing its area or intensity, altering its rhythm, raising its pitch, or rendering it rougher in quality. 6. Bending the body forwards is said to intensify it, but this is not reliable. It may disappear in the sitting posture, and a change in position may affect the murmur, should fluid be present in the pericardium. 7. A quick inspiration in some cases intensifies the friction-sound and raises its pitch. 8. Rapid changes are liable to take place during the progress of the case, as regards the site, extent, rhythm, and characters of a pericardial murmur.

It is necessary to mention that pericardial friction-sound may be simulated by pleuritic modified by the cardiac action. Its position, which is generally about the left border of the heart, marked irregularity, and cessation when the breath is held, will usually serve to distinguish the latter.

A *pericardial splashing sound* has been described, produced by succussion, and due to the presence of air and fluid, but it is extremely rare.

B. EXAMINATION OF THE ARTERIES.

In directing physical examination to the arterial system, it is well first to attend to the great vessels of the chest and neck, and then to the arteries of the limbs, especially the brachial and radial.

EXAMINATION OF THE ARTERIES OF THE CHEST AND NECK.—The chief abnormal conditions which may be observed here may be thus summarized:

I. *Bulging*, which may be caused by aneurism.

II. *Changes in the amount and characters of pulsation as seen and felt.*

1. Excessive pulsation may be associated with: *a.* Excited action of the heart. *b.* Hypertrophy of the left ventricle. *c.* Aortic regurgitation, which is also characterized by an immediate subsidence of the arteries. *d.* An atheromatous condition of the vessels. *e.* Aneurisms of various kinds, which present a limited excessive impulse, usually expansile and heaving. 2. In cases of mitral regurgitation there is sometimes almost an entire absence of pulsation in the carotids and subclavians, even when the heart is much hypertrophied.

III. *Thrill.* Arterial thrill may be associated with: 1. Anæmia. 2. External pressure. 3. Diseased vessels and aneurisms, especially general dilatation with atheroma or calcification. A thrill may be felt in the suprasternal notch, owing to the aorta being thus affected.

IV. *Abnormal dulness and resistance.* The only morbid condition of an artery which can give rise to this deviation is an aneurism.

V. *Murmurs.* An arterial murmur is usually synchronous with the cardiac systole. Its causes are: 1. Pressure by the stethoscope, particularly over the third part of the subclavian, which may produce a murmur even in health, but especially in connection with hypertrophy of the heart, aortic regurgitation, or anæmia. The anæmic murmur is usually very easily induced, of high pitch, and blowing, whiffing, or whizzing quality, and may be heard extensively. 2. Pressure by a tumor, enlarged glands, or fibrous thickening and adhesions. One of the best illustrations is the subclavian murmur heard below the left clavicle in some cases of phthisis. 3. Roughness of the inner surface of an artery, from atheroma, calcification, erosion, exudation, or fibrinous coagula. 4. Change of form in an artery, viz., aneurism, in which the murmur may be systolic, diastolic, or both, and coarctation. 5. Abnormal communication between a large artery and vein, such as between the aorta and superior vena cava.

EXAMINATION OF THE ARTERIES OF THE LIMBS.—The brachial artery just above the bend of the elbow gives the best indications as to morbid states of the arterial system generally, especially atheroma and calcification. On bending the elbow the vessel is distinctly visible and tortuous, presenting a vermicular motion with each pulse; while it feels more or less hard and rigid, full, incompressible, and rolls like a cord under the finger.

THE PULSE.—Usually the radial artery at the wrist is made use of for observing the characters of the pulse, but it is often advantageous to look to other arteries, such as the brachial, temporal, or carotid, and when investigating local conditions special vessels must of course be attended to. The methods of examination are by inspection, palpation, and the use of the sphygmograph; and the points to be noticed include: *a.* its visibility or invisibility; *b.* frequency; *c.* quickness (sharp,

abrupt, slow); *d*, volume (large, full, small, thready); *e*, force and degree of resistance or tension (strong, weak, extinct; soft, hard; compressible, incompressible; equal or unequal); *f*, rhythm (regular, irregular, intermittent, lagging behind cardiac systole, continuous); *g*, special characters, both to sight and touch (rigid, tortuous, bounding, hammering, jerky, undulating, with sense of sudden subsidence, vibrating or thrilly, tremulous, dicrotic, or reduplicate). The term *dicrotic*, when applied to the pulse as felt by the finger, implies that this has a sensation of being doubled; now, however, it has a special significance, as indicating a peculiar character of the pulse brought out by the sphygmograph; *h*, sphygmographic tracings; *i*, the effects of change of posture, and comparison of the characters of the pulse on opposite sides. These points are only required to be observed in exceptional cases.

THE SPHYGMOGRAPH.—For fuller information respecting this instrument reference must be made to the standard physiological works, and to the writings of Marey, Burdon-Sanderson, Anstie, Balthazar Foster, and others, on the subject. The sphygmograph must be seen in order to be properly understood, but it may be stated what it essentially consists of. An elastic steel spring, of sufficient strength, is provided on the under surface of one end with a convex piece of ivory, which is placed over the artery, the other end being fixed to the framework of the instrument. By a certain arrangement the movements produced in this spring by the artery are transmitted to a narrow lever moving on a pivot, and long enough to amplify them considerably. At the free extremity of this is a little pen, made of flexible metal, which traces the motions either on a piece of glazed paper by means of ink, or on smoked glass. This paper or glass is made to travel quickly and steadily in a certain direction, by the aid of an apparatus with clock-work which is wound up, and the plate can be started or stopped at will by a regulator. As it passes along the pen traces upon its surface the movements communicated from the pulse through the spring.

A sphygmographic tracing is generally taken over the radial artery, the apparatus being fixed on the front of the forearm, with the end of the spring over the artery near the wrist, being kept in its place by elastic bands passing round the forearm, the back of which rests on a pad. It is no easy task at first to fix the instrument so that the pulsations are rendered evident; and to regulate the pressure on the artery so that it shall not be too great or the reverse, and that thus the movements may be made visible in their maximum degree; this regulation is effected by means of a screw, and is a matter of much importance.

Description of a sphygmographic tracing. The entire tracing, of which Diagram 1 is intended to give a general idea, is made up of a series of curves or pulsations, each of which corresponds to a complete revolution of the heart's action. It is necessary first to study the char-

acters of an individual typical curve. It may be described as consisting of a *systolic* and *diastolic* part, corresponding respectively to the period of contraction and dilatation of the ventricle, or may be divided into: *a*, line of ascent; *b*, summit; *c*, line of descent, in which are two or sometimes three secondary waves, with intervening notches, named *first* or *distension* wave; *second* or *great* wave, or *true diastolic*;

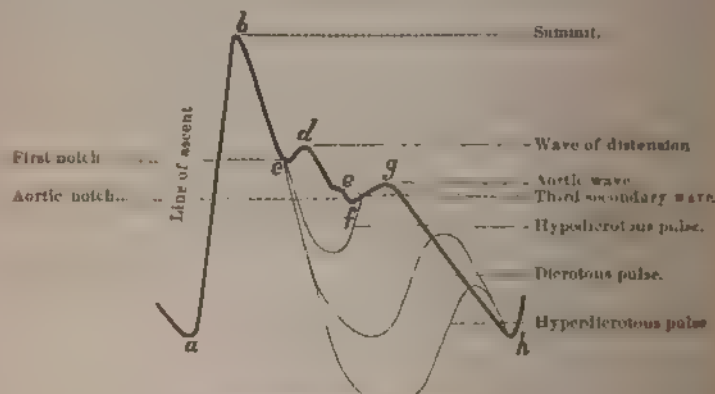
DIAGRAM 1.



Sphygmograph tracing

and *third*, which lies between the other two, but is usually absent. In order to explain these, it is necessary to point out certain facts in the physiology of the circulation, of which the sphygmograph has given far more accurate knowledge than was previously possessed; and to indicate the connection of each with the various parts of a pulse-curve. It will be well to take them in the order in which they occur, and their relation to the different parts is indicated in Diagram 2. 1. The ventricle contracts more or less suddenly, opening the aortic valves, which

DIAGRAM 2.



Enlarged Sphygmographic Curve

give an impulse to the blood in the arteries; thus is produced the *line of ascent*, *summit wave*, or *percussion impulse* (*a* to *b*). 2. After this sudden vibration the arterial walls partially collapse, which is indicated by the first part of the line of descent, ending in the *first notch* (*b* to *c*). 3. A wave of blood next passes out of the heart into the aorta, and this

gives rise to the *first secondary wave, wave of distension or systolic pressure* (*c to d*). 4. After this there is a reflux of blood towards the heart, by which the aortic valves are closed, which corresponds to the portion of the line of descent from *d to f*, ending in the *great or aortic notch* (*f*). 5. During this reflux a vibration may occur, producing the *third secondary wave* (*e*), which is placed as it were in the aortic notch, and which, as already stated, is generally wanting. 6. The aortic valves are then suddenly closed by the pressure of the reflux-current of blood, and thus is originated the *great secondary wave or true dicrotism* (*f to g*). 7. Finally, the blood flows onward in the vessels, this corresponding to the remainder of the line of descent (*g to h*); after which the ventricle contracts again, and the same series of phenomena is repeated.

It will be seen on studying this description, that the systolic portion of the curve extends from the beginning of the line of ascent to the bottom of the aortic notch (*a to f*), during which the ventricle is either contracting or contracted; the rest of the line of descent corresponding to the diastole.

In observing a pulse-tracing, the following are the particulars to be noted: 1. The number of the pulsations on the tracing, which gives the exact frequency of the pulse. 2. With regard to each curve: *a*, the length of the line of ascent, and whether it is vertical or more or less oblique; *b*, the shape of the summit, whether it is acute, rounded, or square; *c*, the presence, size, and position of the secondary waves; *d*, the direction and length of the part of the line of descent beyond the aortic wave, and if there are any undulations in it. 3. The relative characters of the curves in a tracing, especially their height and depth, observing whether their summits and bases are on the same level or not, which may be determined by drawing a horizontal line along the top and bottom of the tracing, these being respectively the lines of the greatest and least arterial tension. In this way the regularity or irregularity of the pulse is determined with precision.

The conditions which chiefly modify the sphygmographic tracing are: 1. The rapidity and force of the ventricular contraction. 2. The degree of arterial tension or resistance, which is influenced by the condition of the walls of the vessels; the controlling effect of the nerves upon them; and the degree of difficulty in the onward passage of the blood, either in the distal part of the artery itself, or through the capillary circulation. 3. The quantity of blood sent into the vessels, which is to some extent dependent upon the duration of the interval between the pulsations, as, if this is long, the blood flows onward, and thus the quantity in the arteries is diminished, and the pressure lessened. 4. The volume of the artery. 5. The condition of the aortic valves.

The more rapidly the ventricle contracts, the more vertical will be the line of ascent, while the height of this is in proportion to the force of contraction. If the ventricle is acting feebly the summit is more

rounded. High arterial tension tends to diminish the height of the line of ascent, and render it more sloping; to make the first secondary wave proportionately more developed, and to raise it until it ultimately becomes blended with the apex, making this round or square; to do away with all minor waves; to lessen the aortic wave; and, if there is obstruction to the onward passage of the blood, to make the remainder of the line of descent slightly convex upwards, and to shorten it. Low tension produces the opposite effects, and is often attended with vibratory undulations in the line of descent, it being only when this condition exists that the third secondary wave is observed.

A healthy pulse-curve has a line of ascent nearly vertical and of moderate height; an acute summit; a gradual descent, presenting usually only the distension and aortic secondary waves. This form of pulsation is sometimes called *tricrotous*, because it has three waves. It must be remembered that physiological variations of the pulse-tracing will arise from taking food or alcohol, over-exertion, external heat, severe emotion, and other causes.

Certain terms are used in describing sphygmographic curves, which it is requisite to notice. When the first secondary wave is absent or nearly so; the aortic notch deep (owing to the closure of the valves being delayed), so that it is on a level with the base of the curve; and the aortic wave prominent, the pulse is called *dicrotous*. (See Diagram 2.) It indicates very low arterial tension. A less degree of this is named *hypo-* or *sub-dicrotous*. A greater degree, so that the aortic notch sinks below the level of the curve basis, the aortic wave forming part of the line of ascent of the next pulsation, is termed *hyper-dicrotous*. *Mono-crotous* signifies that there is only the primary wave; and *polycrotous*, that there are a number of undulatory vibrations.

Uses of the Sphygmograph in disease. Undoubtedly the sphygmograph gives much more exact and accurate information with regard to the circulation than can be obtained by merely feeling the pulse, especially with respect to the action of the heart and the degree of arterial tension, while it reveals irregularities and inequalities which cannot otherwise be detected. It is employed for purposes of diagnosis and prognosis, and for indicating treatment. Its diagnostic value has, by different observers, been advocated in aortic disease, especially regurgitation; cardiac hypertrophy; senile degeneration of arteries; capillary disease associated with degenerative processes in tissues; and aneurisms; it being necessary in the last-mentioned to compare the pulses on the two sides. The characteristic features will be pointed out under the several diseases.

For prognostic and therapeutic indications the tracings obtained by the sphygmograph are very useful in fevers and other acute diseases, such as delirium tremens, pericarditis, pleurisy, or especially for comparing them with the temperature. Among the principal dangerous

signs are a marked dicrotous, hyper-dicrotous, or monocrotous pulse; great inequality and irregularity; or a small curve; the ascent being short and not vertical, with a rounded or square summit.

C. EXAMINATION OF THE VEINS.

The veins from the examination of which most information may be gained are those of the neck and the superficial veins of the chest. In many cases it is also useful to observe the superficial veins of other parts, especially those of the abdomen and legs. In examining the veins of the neck special attention should be paid to the right external jugular, and to the venous sinus at the junction of the subclavian and internal jugular. The following are the important abnormal signs in connection with these vessels:

I. *Enlargement.* It is necessary to observe the degree of this; whether it is permanent or variable; and if the vessels are knotted or varicose. *Causes.* 1. Tricuspid regurgitation. 2. Obstruction of the superior vena cava, innominate, or some more local vein, owing to pressure by a tumor or other morbid condition, or internal plugging by a thrombus. 3. An aneurism communicating with a large vein in the thorax.

II. *Excessive distension of the veins of the neck after a cough.* During the act of coughing these veins always fill more or less, but when they are dilated and the valves are inefficient they become much more distended than usual, and the degree of imperfection in the valves may often be thus indicated.

III. *Pulsation and filling from below.* Some believe that these characters can be seen even in healthy persons, but at any rate they are scarcely appreciable. In order to observe them the patient should assume a recumbent posture, with the head low. Generally pulsation can only be seen, but when very powerful it may also be felt. Care must be taken not to mistake transmitted arterial pulsation for venous. In order to detect filling from below, it is requisite to press upon the right external jugular near the clavicle, and then draw the finger up the neck along its course, keeping up the pressure; it usually fills in jerks. *Causes.* 1. Tricuspid regurgitation alone may lead to pulsation, but usually this is soon associated with—2. Inefficiency of the valves of the veins, which renders the pulsation more marked, and which must exist before there can be any filling from below. 3. Light hypertrophy considerably intensifies venous pulsation.

IV. *Venous thrill.* A thrill is in very exceptional instances felt in connection with the veins of the neck. It may accompany pulsation; or be due to extreme anæmia.

V. *Venous murmurs.* 1. *Venous hum*, "*bruit du diable*." This is the only venous murmur which is at all likely to be met with, and it is very

common in connection with anæmia. Best heard at the junction of the right internal jugular and subclavian, especially on twisting the neck a little to the left, it may, however be extensively diffused along the veins. It is continuous and uninterrupted, though not uniform in its intensity; of variable quality, such as humming or musical, blowing, buzzing, rushing, or whistling. Inspiration, pressure, and the erect posture intensify the venous hum; while it is loudest during the ventricular systole, being in proportion to the force and rapidity of the current of blood. 2. *Intermittent venous murmurs* have been described, associated with tricuspid regurgitation, hypertrophy of the heart, and other morbid conditions, but they must be extremely exceptional.

CHAPTER XIX.

FUNCTIONAL DISORDERS OF THE HEART.

1. ANGINA PECTORIS—SUFFOCATIVE BREAST-PANG.

ETIOLOGY.—Angina pectoris is supposed to be a neurotic affection, associated with the cardiac plexus, and directly due, according to some to spasm, according to others to paralysis of the muscular walls of the heart. In the large majority of cases it supervenes upon some organic disease of the heart or pericardium, but not invariably; while it is not confined to any particular morbid condition, though most common in connection with extensive atheroma or calcification of the coronary arteries; fatty degeneration of the heart; and flabby dilatation. The *exciting cause* of an attack may be centric, *e. g.*, emotion; reflex, as from dyspepsia, cold, or straining; or probably some intrinsic disturbance of the cardiac ganglia. Certain distinct *predisposing causes* have been made out, viz., the male sex; advanced age, the complaint being rarely observed under 45 or 50; and a high social position.

SYMPTOMS.—An attack of angina pectoris comes on as a rule with abrupt suddenness, but warnings of its approach are occasionally present, in the way of curious sensations or slight pain about the cardiac region. The first paroxysm generally sets in while the patient is walking up a hill, against the wind, after a meal, and especially after breakfast.

The chief symptom is an intense pain in some part of the præcordial region, which may amount to the most excruciating torture. In character it is described as shooting, plunging, tearing, aching, gnawing, sickening, or burning, but it is often indescribable. At the same time a feeling of oppression or constriction is experienced across the chest,

as if it were being forcibly compressed and could not be expanded, attended with a sense of suffocation and inability to breathe, though this act is not really interfered with, and there is not the least indication of cyanosis. If a deep breath can be taken and held, this may relieve the pain. Usually no tenderness is felt, but pressure rather gives relief, though occasionally tenderness over the sternum and adjoining spaces is complained of. Frequently painful sensations shoot from the heart in various directions, such as down the left arm, or sometimes the right, even to the fingers; up the left side of the neck; directly backwards; or round the side.

There is evidence of grave general disturbance. The face becomes pale and covered with cold sweat; the expression is one of intense anxiety, alarm, and dread of impending death. In most cases the pulse tends to become feeble and even fluttering or irregular if the attack is prolonged. Much will depend on the condition of the heart with which the angina is associated, which also influences the physical signs. Occasionally vomiting and eructations accompany the attack. The patient is quite conscious at first, but in prolonged or fatal cases may fall into a state of syncope, and spasmodic movements or even general convulsions may be observed.

Usually an entire attack is made up of several brief paroxysms with intermissions, but there may be only one; the morbid sensations generally cease suddenly, this being attended with a sense of extreme relief, though there is a feeling of exhaustion afterwards, which may last for some time. Very rarely does the first attack prove fatal, but it may thus terminate, either suddenly or gradually. Probably some cases of sudden death are due to angina. A marked character of the complaint is its great tendency to recur under the influence of very slight exciting causes.

A form of angina pectoris is described, which is not attended with pain, *angina sine dolore*. Here also an affection may be alluded to, named *pseudo-angina pectoris*, which is met with among young persons, being attended with sudden pain and unpleasant sensations about the heart, palpitation, disturbance of breathing, faintness and giddiness, pallor of the face, and feeble pulse. The condition of the patient may appear to be really serious, but very rarely does a fatal termination happen. This complaint is chiefly observed in connection with anæmia; various nervous disorders, especially hysteria; or blood diseases, such as gout.

PROGNOSIS.—True angina pectoris is a very dangerous condition, but that which simulates it is not, therefore it becomes important to distinguish between them. The presence and nature of any organic cardiac lesion will necessarily influence the prognosis materially.

TREATMENT.—1. In order to prevent attacks, any one who is subject to angina should avoid every possible exciting cause, and it is desirable

to carry some remedy in the pocket, especially opium, so that it may be made use of immediately the least indication appears of the approach of a paroxysm. 2. During an attack any obvious source of reflex disturbance, such as indigestible food, must be at once removed. The important internal remedies are sedatives, antispasmodics, and stimulants, especially opium in full doses, hydrate of chloral, the various ethers, chloroform, spirits of ammonia, musk, camphor, and hot brandy and water. Digitalis and belladonna are very useful in some instances, when the cardiac action is much disturbed. Inhalations of chloroform, ether, or especially nitrite of amyl, might be tried carefully in severe cases. Local applications, such as dry heat with friction, sinapisms, or friction with chloroform or belladonna liniment, may be employed. Gentle galvanism has also been recommended. In a gouty person the joints of the feet should be irritated. 3. During the intervals the treatment is that which applies to cardiac affections in general, in the way of regulating the diet and digestive organs, attending to the general and constitutional condition, as well as that of the blood, and to all hygienic matters. Tepid or cold baths followed by friction, and change of air and scene, are often beneficial. A belladonna plaster should be worn constantly over the cardiac region.

For *pseudo-angina* similar remedies are indicated during a paroxysm, but they need not be so powerful. At other times the treatment must be directed to the cause of the complaint, and the condition of the patient.

II. SYNCOPE—FAINTING.

The phenomena associated with syncope are due primarily to failure in the action of the heart, which is speedily followed by symptoms resulting from anæmia of the nervous centres, and these by failing pulmonary functions.

ETIOLOGY.—The chief *predisposing causes* of syncope are early adult age, the female sex, a nervous temperament, and weakness, with an impoverished condition of the blood. *Exciting causes.* Some of the causes below mentioned seem to lead to a condition allied to "shock," in which the three chief systems appear to be almost simultaneously affected, though probably the nervous centres are first disturbed; it is not always easy to determine whether a case should be classed as one of syncope or shock. They may be arranged under the following heads: 1. Want of blood in the cavities of the heart, from rupture of its walls or of a great vessel, or severe hæmorrhage from any cause; obstruction in the principal veins, or sudden removal of pressure from the great ~~veins~~, as when syncope follows paracentesis abdominis for ascites. 2. ~~Want~~ ^{ply} of blood to the cardiac walls, as from obstruction; or a supply of impure blood, as in low fevers, or in a hot and crowded room. 3. Partial or

complete paralysis of the muscular tissue of the heart, either from some organic change, or from nervous disturbance, centric, reflex, or intrinsic. Numerous causes of syncope act in this way, such as fatty and other degenerations of the heart, flabby dilatation, or a weak state of this organ in certain chronic diseases, *e. g.*, cancer or phthisis, sudden reflux of blood in aortic regurgitation; various poisonous substances, *e. g.*, aconite, tobacco, prussic acid, antimony; strong emotion, and severe cerebral lesions; long continuance in a warm bath; reflex disturbance from bad smells or unpleasant sounds; pain of any kind; extensive burns; passage of a catheter; a shock to the sympathetic trunk, as from a blow in the epigastrium; drinking cold water when heated; taking indigestible food; or overeating after fasting. Lightning sometimes kills in this way. 4. Continued spasmodic contraction of the heart, *e. g.*, in angina pectoris probably. 5. Mechanical pressure outside the heart, as in some cases of great pericardial effusion.

ANATOMICAL CHARACTERS.—The state of the heart varies considerably according to the cause of the syncope. After great loss of blood it is usually contracted and empty. When the walls are paralyzed the cavities are dilated and contain more or less fluid or coagulated blood. The lungs are usually anæmic, and the nervous centres markedly so.

SYMPTOMS.—Syncope may come on quite suddenly, or even cause instantaneous death. In many cases, however, it is gradual in its onset, there being premonitory symptoms before actual insensibility occurs. These are a sense of faintness, giddiness, and trembling, with sinking in the epigastrium, nausea, and sometimes vomiting; pallor, especially of the face, with drawn features; chilliness and shivering, or in some cases a sense of heat, there being at the same time cold, clammy perspirations; a very rapid, small, and weak pulse, tending to become irregular and slow, though the large arteries may throb; hurried, irregular, or gasping breathing, often attended with sighing; great restlessness, and occasionally slight convulsive movements; mental confusion; and disturbance of the senses of sight and hearing, indicated by more or less dim vision, extreme sensibility to light, and noises in the ears. When the syncopal state is complete, the symptoms are absolute insensibility, with dilatation of the pupils; deathlike pallor, with cold and clammy sweats; a slow and extremely weak, irregular, or actually imperceptible pulse; infrequent, irregular respiration, which may ultimately cease altogether. Not uncommonly convulsive movements are observed, and the sphincters may be relaxed, with involuntary discharge of feces and urine. Examination of the heart reveals feebleness or complete absence of impulse and sounds, especially the systolic.

This condition lasts a variable time, and either ends in death or recovery. In the latter case very uncomfortable sensations are usually experienced as the patient returns to consciousness, this being often attended with palpitation, vomiting, or convulsive movements.

TREATMENT.—Any obvious reflex cause of syncope should be at once removed. It is most important to attend to the posture of the patient, which should be horizontal, with the head low. Fainting may not uncommonly be prevented by bending forwards, and hanging the head down between the knees as far as possible. All clothes should be loosened, and plenty of fresh air admitted. The application of ammonia to the nostrils; dashing cold water in the face; or friction along the limbs and over the heart, either with the hand alone or with stimulating liniments, will often restore vitality. The internal administration of stimulants, such as brandy, wine, ammonia, ether, musk, is most useful, and if they cannot be swallowed and there is any danger, stimulant enemata should be employed. Attempts may be made to confine the blood to the central organs, by making pressure on the arteries of the limbs by the aid of the fingers or tourniquets, warmth being maintained by means of hot bottles and friction. Sinapisms or turpentine stupes over the heart should be employed if necessary, and in dangerous cases regulated galvanism along the pneumogastric nerves, artificial respiration, and transfusion are the most potent remedial means available. The last is particularly valuable if the syncope is due to great loss of blood.

III. PALPITATION.

ETIOLOGY.—Formerly palpitation was regarded as evidence of cardiac excitement and increased action, but the tendency now is to regard it as in most cases indicative of a want of power and of laborious effort on the part of the heart, this organ being taxed beyond its powers. The individuals in whom it is most frequently met with are young adults and persons beyond middle age; females; nervous persons, and fat flabby people, who live highly, take but little exercise, and suffer habitually from dyspeptic disorders.

Exciting causes. Palpitation may occur under a great variety of circumstances, but its causes may be thus arranged: 1. Acute or chronic organic diseases of the heart or pericardium. These may induce palpitation either from the muscular tissue being involved and so more or less paralyzed; or from there being some obstruction to the circulation which the heart cannot overcome. When it accompanies hypertrophy it is presumed to be due to the fact that this is insufficiently compensatory, and may indicate commencing degeneration. 2. Mechanical interference with the cardiac action, as from tight lacing; distorted chest; displacement by pleuritic effusion; abdominal enlargements, of which flatulent distension of the stomach is a common form. 3. Diseased condition of the vessels, with inadequate compensatory hypertrophy of the heart, *e. g.*, atheroma, calcification, or hypertrophy of the arterial coats in Bright's disease. 4. Chronic affections of the lungs which interfere with the circulation, such as bronchitis and em-

physema. 5. Some abnormal state of the blood, either as regards its quantity or quality, *e. g.*, plethora or anæmia; the condition associated with gout, renal disease, or fevers; and, probably, the admixture of materials taken into the system from without. There is a difficulty in driving on the blood under these circumstances, and thus the heart is easily disturbed, while at the same time it is itself supplied with impure blood. 6. Causes acting through the nervous system, either centric or reflex, *e. g.*, continued cerebral excitement or mental labor; emotion; functional nervous disorders (hysteria, epilepsy, chorea, neuralgia); the abuse of tea, alcohol or tobacco; reflex disturbance originating in the alimentary canal, as from eating indigestible food; or in connection with the genital organs. The view has been advanced that this nervous palpitation is chiefly due to spasmodic contraction of the arterioles, whereby a difficulty in the passage of the blood is induced. It is very likely, however, that the innervation of the heart itself is also disturbed, its action being thus rendered less efficient.

In some cases palpitation is present at all times more or less, though it is aggravated by anything which throws extra work upon the heart, such as slight exertion. In other instances it is only paroxysmal, being brought on by some evident exciting cause, or independently of this.

Irregularity is a form of cardiac disturbance often existing alone or accompanying palpitation, and it is a still more serious indication of want of power. It may affect only the rhythm, the force, or both. Rhythmical irregularity is due to a halting, hesitation, or partial arrest of the ventricular contraction, which may be brought about by a disturbance of the balance of power between the vagus and cardiac ganglia; or more commonly between the opposition offered to the blood to be driven and the power to drive it (Fothergill). It is often, but not necessarily, associated with grave organic disease, especially dilatation; or with low conditions of the system, such as malignant fevers. The irregularity may appear to be of a hesitating or anticipating character; sometimes it passes through regular cycles, but in other cases the cardiac action seems entirely confused.

Intermittency is the most advanced evidence of cardiac failure, and signifies that there is a complete arrest in the ventricular contractions, until two or sometimes more auricular contractions have occurred, which are required before sufficient blood is sent into the ventricle to rouse it into activity. The conditions with which it may be associated are fatty degeneration of the heart; aortic obstruction; hypertrophy and dilatation; irritation of the vagus nerve, either at its root from cerebral disease, or in its course from pressure of a tumor; the advanced stages of severe fevers; diseases of the lungs causing great obstruction, the left ventricle being disturbed under these circumstances along with the right; or mere nervous disturbance of the heart. It may even be brought on voluntarily, by holding the breath.

rheumatic fever and Bright's disease, and occasionally pyæmia, typhoid, typhus, variola, scarlatina, puerperal fever, gout, scurvy, or purpura. It has been stated to result from the state of the blood in cyanosis; or after the cure of cutaneous diseases of long continuance. 2. From injury, such as a wound of the pericardium, or its laceration by fractured ribs—*traumatic pericarditis*. 3. From perforation, *e. g.*, a neighboring abscess opening into the pericardium—*perforative pericarditis*. 4. From extension of adjoining inflammation; or irritation set up by neighboring disease, *e. g.*, pleurisy, pneumonia, chronic cardiac disease, aneurism of the aorta, abscesses in the vicinity, carious ribs, tumors. In these cases the pericarditis tends to be localized. 5. From the irritation of some new formation in the pericardium, as cancer or tubercle. 6. Idiopathic pericarditis has been described, resulting from "cold;" but it is extremely doubtful whether the affection ever arises from this cause alone.

ANATOMICAL CHARACTERS.—The morbid appearances are similar to those observed in other serous inflammations, and they run a similar course. The exudation is generally deposited on both surfaces, but is usually more abundant on the visceral portion of the pericardium; rarely is it observed over the whole extent of the sac, being generally in patches, and it may be confined to a small area, especially about the great vessels. The thickness and mode of deposit are very variable, the lymph being stratified, or presenting little elevations, ridges, bands, masses, and numerous other arrangements. Usually the material is tolerably consistent, and sometimes quite tough, adhering fairly to the surface. In low conditions it may be soft and granular. The effusion is generally sero-fibrinous, with flocculi floating in it; in exceptional cases it may have blood or pus mixed with it, and in extremely rare instances is actually purulent. The quantity is not usually above from eight to twelve ounces, but may range from an ounce or two to three pints or more. Gas is sometimes present from decomposition of the fluid. Sloughing of the membrane is said to occur occasionally.

The processes of absorption and adhesion are precisely identical with those described under pleurisy. The adhesions may be merely in the form of loose bands, or of extensive agglutinations of the two surfaces, and the inflammatory irritation sometimes extends through the pericardium, so as to cause its union with the chest-walls. When seated about the great vessels, the lymph often leads to their adhesion to one another; or it may remain as a hard mass of considerable thickness.

Allusion may here be made to the so-called "white patches" on the pericardium. As a rule these are decidedly merely due to friction; but sometimes they are the remnants of inflammation.

SYMPTOMS.—It is in the course of acute rheumatism or Bright's disease that pericarditis almost always comes under notice in practice, and

it should always be particularly looked for in these affections. It may come on without any evident symptoms, but this is not usually the case, though it must be noted that the clinical phenomena observed will be modified considerably by the disease with which the pericarditis is associated; as well as by its combination with other cardiac inflammations, or with distinct complications, such as pneumonia.

At the outset *local* symptoms are generally present, viz., pain, tenderness, and disturbed action of the heart. The pain is generally felt over a part or the whole of the præcordial region, occasionally in the epigastrium, while sometimes it shoots in different directions; its severity and characters vary widely, it being described as mere uneasiness, or dull aching, shooting, stabbing, burning, or tearing, and it may amount to the most intense suffering. Tenderness is experienced as a rule over the spaces, as well as in some instances when upward pressure is made over the epigastrium. The disturbed cardiac action is indicated by palpitation, sometimes violent. An attack of pericarditis may be ushered in by slight rigors, followed by pyrexia. In practice, however, these phenomena are frequently absent, there being no increase of fever previously existing. The pulse is necessarily hurried, and may be very frequent.

When fluid accumulates the pain generally subsides, but the action of the heart is interfered with, as well as the functions of neighboring structures, in proportion to the quantity of the effusion. Hence grave symptoms may arise, indicating a tendency to syncope; loading of the right heart and venous system; interference with the respiratory functions; or severe nervous disturbance. The pulse often becomes very frequent, feeble, small, and in bad cases irregular. Sometimes it is slow and labored. Dyspnœa is present, and may be extremely severe, amounting to constant or paroxysmal orthopnœa, with a sense of great oppression across the chest. A dry, irritable, spasmodic cough is not uncommonly observed. In grave cases the face assumes a very anxious and distressed expression, and becomes pale or more or less cyanotic; the expired air is cool; and the extremities feel cold. The mode of decumbency is generally on the back, with the head high; some patients prefer lying on the left side, others on the right; while occasionally they are obliged to be propped up or even to bend forwards. Frequently there is much restlessness, if the patient is not prevented from moving, on account of rheumatism. Headache and sleeplessness are common, and among occasional severe nervous symptoms may be delirium, occasionally almost maniacal; stupor; subsultus tendinum and jactitation; clonic or tonic spasms; choreiform or epileptiform symptoms; and dysphagia. In most cases, however, these probably depend rather on the general condition with which the pericarditis is associated. Vomiting is sometimes a prominent symptom. Should death take place, it usually results from syncope, which may be sudden, from

making the patient assume a sitting position when the pericardium is very full of fluid; interference with the aeration of the blood and with the circulation, the lungs becoming œdematous, and dropsy setting in; or from nervous disturbance.

PHYSICAL SIGNS.—In the early stages the only reliable signs of pericarditis are: 1. Excited action of the heart, as evidenced by the impulse. 2. Pericardial friction-fremitus, which is extremely rare. 3. Pericardial friction-sound. It must be mentioned, however, that friction-sound may be absent, either on account of the soft nature of the lymph, or of its being deposited only on one surface or at the back of the heart.

In the effusion stage the *physical signs* will be in proportion to the quantity of the fluid, and are of the following nature: 1. Bulging of the cardiac region, especially in young persons. This may extend from the second to the sixth or seventh cartilage, the spaces being widened or even protruded, and sometimes the left edge of the sternum is pushed forwards. Local measurements are increased. 2. The impulse presents several important changes. *a.* It is displaced, usually upwards and to the left, but sometimes downwards; while it is altered by change of posture. *b.* Its force is much diminished, and the impulse may be visible when not perceptible to the touch. Often it can be felt in the erect or sitting posture, when absent in the lying posture. There is sometimes great irregularity in force. *c.* In rhythm the impulse tends to be delayed slightly after the systole; it may be extremely irregular. *d.* The character is undulatory when there is much fluid, this being observed over a variable area, and being modified by position; the undulations usually appear to pass from below up and from left to right, but they may have a horizontal direction. 3. Cardiac dulness is materially altered in extent, degree, and shape. It increases first about the base of the heart, extending upwards and then laterally. Usually it does not pass below the sixth rib, but in extreme cases may reach considerably lower than this, the fluid pushing down the diaphragm and causing protrusion of the epigastrium. In an upward direction it may extend as high as or even above the clavicle, and transversely from the right border of the sternum to beyond the left nipple. A very important character may be observed when the fluid is abundant, viz., that dulness extends to the left beyond the apex-beat. The shape of the dulness is more or less triangular, with the apex upwards. Its intensity is unusually marked. Change of posture will modify it; the area is larger in the lying than the erect position, but if the amount of fluid is not very great, it extends higher in the latter posture. 4. The heart-sounds are more or less feeble at the apex, and appear deep, but on passing the stethoscope upwards towards the base they become louder and more superficial. Change of posture may influence them. 5. It is said that a basic systolic murmur is heard occasionally, due to pres-

sure on the aorta. 6. Friction-phenomena often persist for a variable time while fluid is accumulating, becoming by degrees less marked, or being only observed in certain positions. 7. Pericardial effusion will necessarily affect neighboring structures, especially the lungs. Vocal fremitus and resonance, as well as breath-sounds, are diminished in area over the cardiac region; ægophony is occasionally heard above and to the left, while vocal resonance is intensified on the borders of the dulness. Dulness at the base of the left lung may possibly be observed, from partial collapse, the result of pressure on the bronchus or lung. The liver and spleen are in some cases depressed, along with the diaphragm.

Should absorption take place, the signs become gradually normal in favorable cases, and it is only requisite to notice that the dulness diminishes from above and laterally; and that the friction signs return, usually in an increased degree, the sound also assuming more of the "churning" and "clicking" characters. The phenomena indicating chronic adhesions will be hereafter considered.

DIAGNOSIS.—In the early period the chief matter in diagnosis is to distinguish pericarditis from endocarditis. Symptoms are by no means reliable, but severe local pain would be in favor of pericarditis. The diagnosis, however, must be founded on the different characters of the morbid sounds present in each case, being aided occasionally by the existence of friction-fremitus. When any difficulty is experienced, which is not uncommon at first, the case must be thoroughly watched in its further progress. Pericardial friction might be mistaken for pleuritic of cardiac rhythm; or it might be simulated by œdematous integuments, fluid in the mediastinum, or the friction of a cirrhotic liver.

Pericardial effusion is most liable to be mistaken for cardiac enlargement, but the circumstances under which it arises, with the symptoms and physical signs which characterize this condition, ought rarely to leave any doubt as to the diagnosis. The dulness of pericardial effusion might be confounded with certain extrinsic conditions, which will be again pointed out; the distinctions between inflammatory effusion and mere hydropericardium will be indicated under the latter.

TERMINATIONS.—Pericarditis may end in practical recovery, generally, however, some adhesions remaining; in death; or by becoming chronic, either the effusion remaining and in rare instances becoming purulent or even pointing on the surface, or extensive agglutinations forming, which greatly disturb the cardiac action. As a consequence hypertrophy or dilatation may follow, or in exceptional cases atrophy or fatty degeneration, owing to pressure on the coronary arteries.

PROGNOSIS.—The immediate prognosis will depend upon the condition with which the pericarditis is associated, it being, for instance, very dangerous in Bright's disease; the amount and nature of the ef-

fusion; the previous condition of the heart; the state of the pulse, as indicated especially by the sphygmograph; whether the disease is complicated with other inflammations; and the severity and character of the symptoms. Marked nervous symptoms are of very serious import. The ultimate prognosis will be entirely governed by the conditions left behind; extensive agglutination and permanent displacement of the heart, owing to adhesions, are untoward events.

TREATMENT.—The principles of treatment in pericarditis are similar to those mentioned for pleurisy, but as the former occurs almost always in the course of some other complaint, its management must be modified accordingly. When it occurs during acute rheumatism, the treatment for this affection must be persevered in, and opium given freely for the purpose of calming the excited action of the heart, care being taken, however, to avoid narcotizing the patient should there be cyanotic signs. Venesection and mercurialization are never admissible. A few leeches may be sometimes beneficial in robust subjects, but as a rule the persistent application of heat and moisture over the præcordial region, by means of linseed poultices or fomentations, is the most serviceable local treatment. Great care must be taken that the applications are frequently changed; and that the chest is not unduly exposed and chilled. Cold is strongly recommended by some observers, as strongly condemned by others; it certainly should only be tried very cautiously. Aconite, veratria, and tartar emetic have also been given to calm the heart's action, but these are dangerous remedies in pericarditis.

For the removal of effusion, the application of blisters or strong iodine may be tried, if necessary, with diuretics and iodide of potassium internally. Tincture of iron in full doses is decidedly a valuable drug at this time, and tonics are often useful.

As a rule a good quantity of nourishment is required, and often a little stimulant is indicated; if there is much depression, with a failing pulse, a considerable amount of brandy may be necessary, and digitalis is highly spoken of under these circumstances. The patient must not be examined unnecessarily or made to sit up, should there be any danger of syncope.

Paracentesis is called for in rare instances, in order to relieve dangerous symptoms, or to remove purulent fluid. Some advocate early recourse to this operation, but for obvious reasons it ought not to be rashly practiced. The fluid is best removed by the aspirateur.

In pericarditis complicating Bright's disease or low fevers free stimulation is usually required, while opium is contraindicated or must be employed with exceeding caution.

II. CHRONIC PERICARDITIS—ADHERENT PERICARDIUM.

ANATOMICAL CHARACTERS.—Chronic effusion may remain after peri-

carditis; or sometimes the surfaces of the membrane become universally agglutinated, and calcareous matter may be deposited in the adhesions; or the outer surface of the pericardium may unite with the chest-wall.

SYMPTOMS.—Subjective symptoms are often absent, but there may be uneasy sensations or even a dull pain in the cardiac region, and, in exceptional cases, anginal attacks have been noticed. Disturbed action of the heart; palpitation easily induced; and shortness of breath on exertion are the chief symptoms complained of, if any. From the effects of extensive adhesions upon the heart grave interference with its action and with the circulation may ultimately arise. An agglutinated pericardium will seriously increase the danger from an attack of any pulmonary inflammation.

Physical examination may reveal fluid in the pericardium, or when adhesions have formed between its surfaces as well as with the chest-wall, the signs are more or less of the following character: 1. Depression of the præcordial region, with narrowing of the spaces. 2. Increase in extent or permanent displacement of the impulse, especially elevation, without there being any obvious cause for this; the apex-beat being unaltered by change of posture or by a deep inspiration; or the impulse having altogether unusual characters, being attended with recession of the spaces or epigastrium, or with an irregular jogging movement, both systolic and diastolic. 3. Usually increased area of dulness, which is not altered after a deep breath, there being other signs that the lungs do not expand over the cardiac region. When there is external calcification, the percussion-sound is said occasionally to have an osteal character. 4. Some variety of friction-sound may be heard.

III. HYDROPERICARDIUM.

The important facts relating to this condition may be thus summed up, and it will at once be seen in what respects it differs from inflammatory effusion. 1. In the great majority of cases hydropericardium is a part of chronic general dropsy; it has been stated that it may set in acutely in Bright's disease; and rare instances have been met with in which it was mechanical in its origin, having resulted from the pressure of an aneurism or mediastinal tumor, disease of the cardiac veins or their obstruction by a clot, or after sudden extreme pneumothorax. 2. There are no severe initiatory symptoms or pyrexia; nor is there any marked disturbance of the heart's action. 3. The effusion, which is simply serous, is not abundant; hence there is no bulging; the physical signs indicative of fluid are less marked; and the dulness is more liable to be altered by posture. 4. Friction signs are absent throughout. 5. Hydropericardium generally follows hydrothorax, and hence it is preceded by the symptoms and physical signs of the latter, the effects of which it necessarily tends to aggravate.

TREATMENT.—This is merely a part of the ordinary treatment for dropsy. Paracentesis might possibly be required.

IV. PERICARDIAL HÆMORRHAGE.

Blood may be found in the pericardium as the result of: 1. Spontaneous rupture, either of the heart or a cardiac aneurism; an aortic aneurism; one of the coronary vessels; or of vessels in cancerous deposits. 2. Injury. 3. Pericarditis, the effusion being more or less hæmorrhagic. 4. Diseased conditions of the blood, such as scurvy and purpura.

The *symptoms* are generally severe, indicating loss of blood and interference with the heart's action; but they will necessarily vary with the amount of blood present, and the rapidity of its accumulation. Sudden death may occur. The *physical signs* are those of pericardial accumulation.

V. PNEUMO-PERICARDIUM.

Gas is occasionally found in the pericardium, either having entered from without, or resulting from decomposition of fluid. It may give rise to tympanitic resonance, and to succussion-splash if mixed with fluid.

CHAPTER XXI.

ACUTE INFLAMMATIONS OF THE HEART.

I. ACUTE ENDOCARDITIS.

ETIOLOGY.—Almost invariably this affection is associated with some disease in which the blood contains a morbid poison, especially acute rheumatism, occasionally Bright's disease, pyæmia, septicæmia, scarlatina, small-pox, typhoid fever, puerperal fever, and other pyrexial diseases. Probably it results from direct irritation of the endocardium by the contaminated blood.

ANATOMICAL CHARACTERS.—It rarely happens that the endocardium is seen in the early period of inflammation, when it merely presents bright redness, usually with distinct points of increased vascularization. Soon the membrane becomes less smooth, swollen and clouded, less consistent, and loses its polish. Numerous young cells form in the subepithelial tissue, causing it to become thickened, and little vascular villi or granulations also project on the surface. In some cases the endocardium assumes the appearance of a soft velvety membrane. Fibrinous vegetations are soon formed, which are derived directly from

the blood, the fibrin of which is deposited on the inflamed membrane, either in strata or masses of considerable size. Only the left cavities of the heart are usually involved, the orifices and the membrane in their vicinity, with the valves and their appendages, being especially affected. During intrauterine life endocarditis chiefly attacks the right side. The free edges of the valves are much thickened, especially those parts which are exposed to considerable friction and irritation, and the fibrinous vegetations are chiefly deposited on the surface which is opposed to the current of the circulation.

As occasional consequences of acute endocarditis there may be observed fissuring of the membrane; actual ulceration from softening and destruction of tissue, the ulcers being irregular, superficial, and having thickened edges; formation of pus in the deeper layers, ultimately reaching the surface; perforation, rupture, or extensive destruction of a valve; rupture of one or more chordæ tendineæ, the free ends of which may float in the blood, and lead to the deposit of vegetations; or the formation of an aneurism of the heart.

Emboli are very liable to be detached from the fibrinous deposits, and evidences of these may be seen in distant organs; or some of the products of inflammation may be conveyed into the circulation and give rise to septicæmic signs in various parts.

If the inflammatory process subsides, the young tissue develops into an imperfect fibrous structure, and proliferation may go on for some time, thus leading to most serious permanent organic changes, fatty and calcareous degeneration often finally occurring, which increases the damage. This is one of the conditions known as *chronic endocarditis*, but the affection may be chronic from the outset, there being a slow growth of new tissue which tends to develop into a fibroid material. The ultimate changes are similar in both cases, and the chief morbid conditions resulting therefrom are as follows: 1. Thickening, induration, and puckering of some part of the general tract of the endocardium. 2. Thickening of the valves, with opacity, rigidity, and more or less shrinking, by which they may be greatly narrowed and rendered incompetent. 3. Adhesion of the tongues of a valve to each other or to the walls of the heart. 4. Thickening, induration, and contraction of the chordæ tendineæ or muscoli papillares. 5. Narrowing of the orifices, usually accompanied with irregularity, roughness, and hardening. 6. Formation of firm warty growths, either sessile or pedunculated.

When atheroma and calcification take place, the structures present the usual characters which indicate these degenerations.

SYMPTOMS.—Many cases of endocarditis are only revealed by physical examination. *Local* symptoms are always very indefinite, there being little or no pain or tenderness, but palpitation is frequently pres-

ent. The characters of the pulse have been variously stated by different observers; at first it is usually frequent, full, and excited; afterwards it may become feeble, small, and irregular in force and rhythm, but various circumstances influence it. Increased pyrexia may accompany endocarditis, the fever tending to assume an adynamic type. The chief symptoms which may arise in its course, however, are those dependent upon—(a) interference with the circulation at one of the orifices; (b) formation of extensive clots in the heart, causing obstruction, and indicated by extremely frequent and irregular cardiac action and pulse; tendency to syncope; great dyspnœa, amounting to orthopnœa in paroxysms, attended with extreme anxiety, and followed by asphyxial symptoms; and severe disturbance of the nervous system; (c) the conveying of emboli to the spleen, kidneys, brain, and other organs; or of deleterious inflammatory products, the latter giving rise to symptoms of septicæmia.

PHYSICAL SIGNS.—The only positive signs associated with endocarditis are those indicating excited action of the heart; some derangement at an orifice; or extensive coagulation. 1. The impulse is forcible and increased in area; if coagulation takes place, it tends to become irregular in rhythm and force. 2. Increased dullness, especially towards the right, may arise from stagnation of blood and coagulation. 3. The sounds are often altered in character, but this is not to be relied upon. 4. The great sign is the presence of one or more murmurs, but it must be remembered that these may have previously existed. Different observers have given different statements as to the valvular lesion most frequently present. In my own experience *mitral regurgitation* has been decidedly the most common condition in acute endocarditis, but this may in some cases result from irregular action of the muscoli papillares. *Aortic obstruction* is not uncommon. *Pulmonary obstruction* murmur may be observed as the result of coagulation in the right cavities; but on the left side this condition sometimes interferes with the production of a murmur.

DIAGNOSIS.—Not only must endocarditis be distinguished from pericarditis, but it must be remembered that the symptoms arising in its course may cause it to be mistaken for some low fever; and that physical examination should be made at frequent intervals in those diseases in which it is liable to occur, so that it may be detected as soon as it supervenes.

PROGNOSIS.—There is always much immediate danger in connection with acute endocarditis. The remote prognosis will depend on the organic changes remaining, and on the orifice which is affected.

TREATMENT.—The treatment of endocarditis is mainly that of the disease in the course of which it occurs, and there are no direct remedies for this condition. Such measures as bleeding, mercurialization, and application of cold are decidedly to be deprecated. As a rule

stimulants are required, in some cases in large quantities, along with abundant nutriment. Digitalis is indicated if the heart's action is failing. Should there be signs of obstruction from coagulation of blood in the cavities, alkalies and carbonate of ammonia should be given freely, along with alcoholic and other stimulants. Septicæmic symptoms must be treated should they arise.

II. ACUTE MYOCARDITIS.

ETIOLOGY.—Inflammation of the heart-substance is frequently set up in the layers contiguous to an inflamed endocardium or pericardium. It has been stated to have arisen independently in a few instances, either as a diffuse or localized inflammation, the latter having terminated in abscess. Pyæmia and septicæmia frequently lead to myocarditis, with formation of abscesses.

ANATOMICAL CHARACTERS.—Myocarditis is attended with discoloration and softening of the heart-substance, which is infiltrated with a sero-sanguineous fluid, exudation, or sometimes pus, which may collect in abscesses. It may lead to the formation of a cardiac aneurism; or to rupture of the walls of the heart. If recovery takes place, depressed scars may be left.

SYMPTOMS.—The clinical signs of myocarditis are very obscure. It tends to render the cardiac action extremely weak and irregular, and when this is a prominent feature in the course of peri- or endocarditis, implication of the heart may be suspected. The general symptoms are pyrexia of an adynamic type; with signs of blood-poisoning and collapse.

TREATMENT.—The only hope lies in free stimulation.

CHAPTER XXII.

CHRONIC DISEASES OF THE HEART.

In the present chapter it is proposed to give an account of the several chronic morbid conditions to which the heart is liable. Their diagnosis, prognosis, and treatment will be considered in a separate chapter.

I. AFFECTIONS OF THE VALVES AND ORIFICES.

GENERAL ETIOLOGY AND PATHOLOGY.—The various conditions which may give rise to cardiac murmurs have previously been pointed out, and the characters of the different murmurs described (pages 478–481).

At present attention will be directed only to those cases in which there is some definite organic mischief about the valves and their appendages or the orifices of the heart, which interferes with the circulation, either by causing obstruction or by permitting regurgitation. In the first place it will be well to give a general summary of the pathological modes of origin of these derangements. They may arise from: 1. Acute endocarditis, especially, but not solely, in connection with acute rheumatism. 2. Chronic endocarditis or valvulitis, which in many cases appears to be merely a process of fibroid degeneration, the parts affected being very liable to undergo further degenerative changes in the direction of atheroma and calcification. This is observed as a rule in persons advanced in years, especially in gouty subjects, or those suffering from chronic renal disease; it may also occur in younger individuals who are subject to violent physical strain, in consequence of which great pressure of blood is thrown upon the aortic valves, *e. g.*, strikers, colliers, gymnasts, or boat-racers. 3. Laceration of a valve from injury. 4. Chronic myocarditis involving the muscoli papillares, which become contracted and indurated, preventing the valves from closing. 5. Atrophy of the valves, or, as some suppose, congenital insufficiency, rendering them inefficient, or giving rise to so-called "reticulation," or more or less extensive perforation. 6. Enlargement of the cavities of the heart, involving the orifices without proportionate increase in the valves, which are therefore rendered incompetent; or altering the normal relations of the valves and their appendages to the orifices. 7. Congenital malformations, which are supposed to result mainly from endocarditis occurring during intrauterine life. 8. Fibrinous deposits from the blood. 9. Tumors very rarely.

It must be mentioned that more than one orifice may be affected from the same cause; and that disease at one orifice may set up mischief in another, either by direct extension, by throwing an extra strain upon the valves and thus inducing chronic valvulitis, or by enlarging the cavity.

SPECIAL VALVULAR DISEASES.—Having given this general outline, the main facts connected with each orifice will now be considered in detail, under the following headings: 1. Special etiology. 2. Anatomical characters. 3. Clinical phenomena, including the signs immediately connected with the lesion; its direct influence upon the circulation and symptoms resulting therefrom; and its remote effects upon the heart. It must be remarked at the outset that local symptoms are very uncertain. Uneasiness or pain may be present, but is often absent; it is most frequent in connection with aortic disease. Palpitation and dyspnoea are common symptoms, and frequently render the patient incapable of exertion.

I. MITRAL REGURGITATION.—**ETIOLOGY.**—1. Acute endocarditis is the ordinary cause of this condition, the subsequent chronic changes

increasing the primary mischief. 2. Cases occasionally are met with in which no history can be obtained of acute endocarditis, and the affection seems to have been chronic and gradual in its progress from the first. 3. Mitral regurgitation is liable to supervene upon aortic disease, being produced in one of the ways already indicated. 4. Very rarely it may result from mere dilatation of the left cavities, causing enlargement of the orifice, and displacing the muscoli papillares.

ANATOMICAL CHARACTERS.—Among the chief morbid conditions observed in different cases are more or less contraction and narrowing of the tongues of the valve, with irregularity, thickening, and rigidity, there being in some instances scarcely any appearance of a valve; atheroma or calcification; laceration of one of the tongues; adhesion of one or more of them to the inner surface of the ventricle; rupture of chordæ tendinæ; shortening, thickening, induration, or adhesion of these, the smaller ones having often entirely disappeared; contraction and hardening of the muscoli papillares; and deposits of fibrin, sometimes in considerable abundance.

CLINICAL PHENOMENA.—*Immediate Signs.* These are: 1. A systolic thrill at the left apex, present in a certain proportion of cases. 2. Mitral systolic murmur. 3. Intensification of the pulmonary second sound, which is louder than the aortic.

Influence upon the Circulation.—The arterial system will be insufficiently and irregularly supplied; hence the pulse is small, weak, and often unequal in force and fulness, not unfrequently also irregular in rhythm. These characters are shown in the sphygmographic tracing. Two striking phenomena are sometimes observed in connection with mitral regurgitation, viz., that there is an extremely anæmic appearance; and that, though the heart may be acting violently, and the great arteries in the neck may even appear to throb, scarcely any pulsation is felt in them. Through the “back-working” of mitral regurgitation the pulmonary circulation becomes necessarily overloaded more or less speedily, the symptoms and ultimate consequences of which have been already described. Emboli may also be carried from clots in the right heart, and give rise to pulmonary infarctions. In time the right side of the heart and general venous system become involved, venous hyperæmia and its consequences being induced, often to an extreme degree.

Remote Effects upon the Heart.—The left auricle becomes first the seat of dilatation with hypertrophy, and afterwards the right ventricle, which is often greatly enlarged, and as a consequence tricuspid regurgitation follows. A moderate degree of enlargement of the left ventricle is generally observed. Degeneration is liable to be set up in time, and the endocardial lining of the left auricle tends to become thickened, opaque, and atheromatous.

II. MITRAL OBSTRUCTION.—ETIOLOGY.—This condition is always the result of acute endocarditis and its consequences.

ANATOMICAL CHARACTERS.—The mitral orifice is more or less in a state of constriction or *stenosis*: as well as rough, irregular, and thickened; one or other of these conditions predominating. Occasionally the valves adhere together, and a funnel-shaped opening may be thus produced. Abundant vegetations on the valves or about the orifice may cause obstruction.

CLINICAL PHENOMENA.—These differ from those accompanying mitral regurgitation in the following particulars: 1. Thrill is much more frequently felt, and is *præsystolic*. 2. The murmur is *præsystolic* or *post-diastolic*, and differs in its characters. 3. The pulse is regular. 4. The left ventricle is small and disposed to atrophy. The effects on the circulation are similar in both cases.

In not a few instances mitral regurgitation and constriction exist together. The interference with the circulation and the changes in the cavities of the heart are necessarily more easily induced under these circumstances. Frequently there are two distinct murmurs, but there may be but one. Mitral disease is common in young persons.

III. AORTIC OBSTRUCTION.—ETIOLOGY.—1. As a rule chronic valvulitis, ending in atheroma and calcification, originates aortic obstruction, the morbid process being gradual, and hence it is very frequent in old people. It is this valve also which is affected in those who undergo severe muscular strain. 2. Cases are not uncommonly observed, however, in which it can be distinctly traced to acute endocarditis.

ANATOMICAL CHARACTERS.—In most cases the obstruction depends upon the valves, which project inwards, and become rigid, thickened, irregular, opaque, contracted, atheromatous or calcareous, so that they cannot be pressed back, but remain constantly in the current of the circulation. Often they are covered with considerable fibrinous masses, and the opening of the artery may thus be almost completely closed. Occasionally constriction at or about the aortic orifice is the pathological condition giving rise to obstruction.

CLINICAL PHENOMENA.—Immediate signs. These are: 1. Systolic thrill at the right base sometimes. 2. Aortic systolic murmur. 3. Feebleness or absence of the aortic second sound if there is no regurgitation, that over the pulmonary artery being unaffected.

Influence upon the Circulation.—The arteries being imperfectly filled, there is often pallor, with a tendency to symptoms of cerebral *anæmia*. The pulse is small, regular, and compressible, but is generally modified by hypertrophy or degeneration, and under the influence of the latter it may become intermittent. A sphygmographic tracing shows a difficult and very oblique ascent; a round summit; and the secondary waves absent or slight. There is no evidence of obstruction to the pulmonary circulation, unless the mitral orifice becomes involved, so as to

allow regurgitation. It is important to notice that particles of fibrin are very liable to be detached from the valves, and thus to give rise to signs of embolism, especially in connection with the brain.

Effects on the Heart.—The tendency of aortic obstruction is to produce pure hypertrophy of the left ventricle, which compensates for the obstruction so long as there is no degeneration. In time mitral regurgitation is apt to follow, being set up by extension of disease from the aortic valve; or by the forcible pressure of the blood upon the mitral valves.

IV. AORTIC REGURGITATION.—ETIOLOGY.—1. This is also usually the result of chronic changes, and is especially frequent in those who undergo violent strain. 2. Occasionally it follows acute endocarditis. 3. There may be a sudden rupture or laceration of the valve, from extreme pressure thrown upon it. 4. Regurgitation may take place through perforations in the valve, the result of atrophy or congenital insufficiency. 5. In rare instances the orifice is dilated, and the valves therefore cannot close it. 6. Degeneration at the root of the aorta may lead to the imperfect adaptation of the valves, and thus give rise to regurgitation.

ANATOMICAL CHARACTERS.—The ordinary state of the valves is that described under aortic obstruction, and they are often so shrunken, deformed, and rigid, that they permit regurgitation as well as cause obstruction. Sometimes they adhere to the walls of the vessel; or a tongue is seen lacerated, or having a considerable perforation in it; or there may be scarcely any remnants of the valve.

CLINICAL PHENOMENA.—It will be sufficient to point out the important characters which distinguish regurgitation from obstruction. 1. Very rarely is there any thrill, but possibly a diastolic thrill may be felt. 2. A well-marked diastolic murmur is generally present. 3. The pulse is quite characteristic, owing to the blood being forced into the vessels under unusual pressure, causing their excessive distension, but they rapidly subside, however, on account of the regurgitation. This can be observed in all the arteries, and has even been seen in the eye by the aid of the ophthalmoscope. They are visible, tortuous, elongated, and movable with each systole of the heart; the pulse having a jerking, abrupt, and hard feel, succeeded by a rapid subsidence or "fall-back;" the sensation has been well described as resembling "balls of blood shot under the finger." There is no irregularity so long as the heart tissue is healthy. The important characters of the sphygmographic tracing are, that the line of descent falls suddenly, and that the aortic wave is more or less indistinct or absolutely wanting. By observing this the degree of regurgitation may be determined. The line of ascent is usually long and vertical, with a sharp summit, but this may be square or convex if obstruction also exists. The distension-wave is raised, and the notch preceding it exaggerated, while unusual vibratory waves are

not uncommon. A loud murmur is often heard in the arteries. In course of time they are very prone to become the seat of atheromatous degeneration, owing to the repeated strain upon them. 4. The principal morbid change developed in connection with the heart is hypertrophy with dilatation of the left ventricle, which tends to become extreme. This is at first usually in excess of what is required for compensation, which accounts for the great distension of the arteries, while it also gives rise to symptoms indicative of arterial and capillary plethora. Degeneration of the hypertrophied heart is, however, liable to set in soon, for the following reasons: The supply of blood to its walls through the coronary arteries is interfered with, because this depends upon the aortic recoil, and this force is rendered inefficient owing to the incompetency of the valves allowing the blood to return into the heart; while at the same time the aorta and other large vessels become atheromatous, and therefore deficient in elasticity. The mitral orifice is also liable to be involved, as in the case of obstruction, and serious symptoms will necessarily follow this event, as well as cardiac degeneration, the latter setting in in some cases with great rapidity.

V. TRICUSPID REGURGITATION.—ETIOLOGY.—Practically this condition is either associated with dilatation of the right cavities, consequent upon some obstruction in the lungs, especially from emphysema; or it follows mitral disease, being then partly due to disease of the valves from extra pressure upon them.

ANATOMICAL CHARACTERS.—The orifice may be simply dilated, the valves being thus rendered incompetent, but being free from disease; or the valves, especially the fixed tongue, with the chordæ tendinæ, are occasionally contracted and deformed. I have now and then observed much fibrinous deposit upon them, when there was scarcely any organic mischief.

CLINICAL PHENOMENA.—*Immediate signs.* 1. It is stated that a systolic thrill has been felt in the epigastrium, but this must be extremely exceptional. 2. The characteristic systolic murmur is more frequently absent than present, and requires usually an experienced auscultator to detect it. In exceptional instances, however, it is well-marked.

Influence upon the Circulation.—The general venous system suffers speedily and seriously from tricuspid regurgitation, and all the symptoms resulting therefrom follow, this condition being a prominent cause of cardiac dropsy. The abdominal circulation is affected very early, on account of the deficiency of valves here. In addition, some important physical signs are originated, viz., distension and varicosity of the cervical veins, especially of the right external jugular and sometimes of the veins over the chest; venous pulsation in the neck, and, according to some, in the hepatic veins; and filling of the external jugular vein from below, after it has been emptied by pressure. The pulmonary

circulation is relieved, and thus pulmonary symptoms are often diminished.

Effects on the Heart.—Tricuspid regurgitation tends to increase hypertrophy of the right ventricle, and to cause enlargement of the auricle. If considerable it may diminish murmurs on the left side of the heart.

VI. TRICUSPID OBSTRUCTION is a mere curiosity, if it ever exists. It might possibly be the consequence of endocarditis during intrauterine life; and its signs and effects would be similar to those of regurgitation, except that the murmur would be præ systolic.

VII. PULMONARY DISEASE.—A very few observations will suffice for the affections of the pulmonary orifice. They are extremely rare, especially regurgitation. In the great majority of cases obstruction is due to congenital constriction of the orifice, which may be extreme; sometimes the valves are much thickened, atheromatous and calcareous. A systolic thrill and murmur may be observed at the left base. The pulse is not affected, as it is in aortic disease. There are often signs of right hypertrophy and dilatation, followed by overloading of the systemic veins.

II. ENLARGEMENT OF THE HEART.

Enlargement of the heart may be due to: 1. Hypertrophy of its muscular walls. 2. Dilatation of its cavities. In most instances there is a combination of these conditions, though in very variable degrees, and the varieties met with are sufficiently indicated in the following classification: 1. Simple hypertrophy. 2. Eccentric hypertrophy, or hypertrophy with dilatation, the former being in excess. 3. Dilatation with hypertrophy, the dilatation being the more marked. 4. Dilatation with attenuation of the walls, or simple dilatation. A form has been described as concentric hypertrophy, in which the cavities are contracted, but in reality this appearance is merely due to post-mortem contraction of the walls of a hypertrophied heart.

It will be convenient to consider hypertrophy and dilatation together, any special facts relating to either of them being indicated as occasion arises.

ETIOLOGY.—The numerous causes of cardiac enlargement may be ranged under certain heads.

1. *Direct obstruction, either in connection with the orifices of the heart or with the vessels, which interferes with the passage of the blood.* Cardiac obstruction is usually seated at the aortic or mitral orifice, very rarely at the pulmonary. The aorta may be obstructed from extensive atheroma or calcification, aneurism, congenital constriction, or external pressure by an aneurism or other tumor. In connection with the general circulation the conditions giving rise to cardiac enlargement are

extensive atheroma and calcification of the arteries; changes in the arterioles and capillaries accompanying chronic renal disease; and alterations in the calibre of the small vessels associated with exophthalmic goitre. In the pulmonary circulation obstruction may arise from congenital constriction of, or external pressure upon the pulmonary artery; chronic pulmonary diseases, especially chronic bronchitis with emphysema, extensive pleuritic adhesions with retracted side, and interstitial pneumonia; or atheroma of the pulmonary vessels.

Obstruction tends more especially to lead to hypertrophy, but if it is brought about suddenly, a primary dilatation ensues; when the obstruction is gradual in its progress, the hypertrophy is often of the most pure type.

2. *Distension of the walls of the heart during diastole under increased pressure.* This is a most important cause of cardiac enlargement, being chiefly exemplified by aortic and mitral regurgitation, and to a less degree by tricuspid regurgitation. In these conditions there are two currents of blood entering the cavity into which regurgitation takes place, often under excessive pressure. At first dilatation is produced, but in most cases hypertrophy is soon superadded, the relative proportions depending upon various circumstances; the heart may ultimately assume enormous dimensions.

3. *Constrained action of the heart, in consequence of which the contraction of this organ is impeded, and it has to work under physical disadvantages.* Displacement of the heart from any cause, but especially pleuritic effusion; interference with its action from deformed thorax; and pericardial agglutination are the important causes of enlargement coming under this head, and they tend chiefly to develop hypertrophy.

4. It is probable that mere *excessive cardiac action*, such as is observed in habitual palpitation, will induce hypertrophy. Some authorities would explain this by affirming that there is an obstacle in the arterial circulation, owing to contraction of the muscular coat of the vessels, which leads to compensatory hypertrophy.

5. It has been stated that permanent enlargement may follow the dilatation which frequently results from some *temporary loss of resisting power in the walls of the heart*, such as is associated with softening in low fevers; myocarditis accompanying peri- or endocarditis; or nervous debility due to excessive smoking or venery and various other causes. After recovery a compensatory hypertrophy is said to be set up, and Fothergill is inclined to believe that this may lead to a reduction of the ventricular cavity to its original and normal dimensions.

6. I have deemed it best to notice separately that important class of cases, in which cardiac enlargement is the result of *violent effort especially with the arms*, such as is carried on in certain laborious occupations (hammermen, colliers, etc.), gymnastic exercises, rowing, or

climbing mountains. The enlargement is principally due to the obstruction to the circulation which is caused by the muscles crossing the arteries, the former also by their rigid condition opposing the passage of blood through their own vessels; and after a time to the aortic disease which is originated. The excessive action of the heart which is excited from time to time must not, however, be overlooked as probably aiding in bringing about the enlargement. Enlargement of the right cavities is very liable to be developed in runners, swimmers, divers, and others who tax their wind unduly from time to time.

7. *A plethoric state of the system* resulting from over-eating, especially of nitrogenized food, and abuse of alcohol, has been stated to cause hypertrophy of the heart.

8. Cases of hypertrophied heart now and then come under observation in which no cause can be detected, and then the hypertrophy is presumed to be *idiopathic* and *primary*.

With regard to dilatation it is necessary to mention further that this is more liable to follow and is more marked in those conditions which give rise to great internal pressure on the cardiac walls during diastole; when obstruction arises rapidly; and when the walls of the heart are deficient in resisting power from any cause, as after acute or long-continued chronic illness, or when they are the seat of congestion, serous infiltration, inflammation, or various degenerative changes, especially fatty and fibroid.

Before proceeding to the consideration of the morbid appearances and clinical phenomena associated with cardiac enlargements, it is needful to notice certain important circumstances which influence them, viz.: 1. The nature of the enlargement, whether due to hypertrophy, dilatation, or both; and the relative degrees in which these are combined. 2. The part of the heart affected. 3. The state of the cardiac walls. 4. The condition of the valves and orifices. 5. The presence of pericardial adhesions.

ANATOMICAL CHARACTERS.—The important alterations produced in the heart from hypertrophy and dilatation may be stated as follows: 1. *Increase in bulk*, this being in proportion to the dilatation. 2. *Increase in weight*, which is due to hypertrophy, and therefore in the ratio of this. The enlargement and excess in weight vary greatly in degree, the heart being sometimes three or four times heavier than usual, and enormously increased in dimensions. It is then called the *cor bovinum vel taurinum*. 3. *Change in shape*. In general dilated hypertrophy the heart tends to become more or less globular, the apex being rounded or obliterated. If the left cavities are alone involved, and especially merely hypertrophied, the heart is elongated and more conical, the apex of the left ventricle extending downwards some distance beyond the right. When the right side is solely affected, there is a tendency to roundness and increase in breadth, the right ventricle

lying forwards so as to overlap the left and to form the apex. 4. *Alteration in position and axis.* As a rule the heart is lowered, and its apex displaced to the left, while the right border becomes more horizontal, the last character being especially observed in enlargement of the right side, which may also cause increase in an upward direction. 5. *Changes in the thickness of the walls, and in the size and shape of the cavities.* There are generally obvious alterations in these respects, but they vary considerably according to both the absolute and relative amount of hypertrophy and dilatation. The walls of the left ventricle may be $1\frac{1}{2}$ to 2 inches in thickness; those of the right from 1 to $1\frac{1}{2}$ inch. The septum is usually involved, and tends to bulge towards that cavity which is least implicated. It must be remembered that there may be considerable hypertrophy with little or no thickening of the walls, because it is accompanied with much dilatation. In simple dilatation the walls of an auricle may become so thin as to consist of scarcely anything but pericardium and endocardium, and to be almost transparent. 6. *Physical characters of the heart-tissue.* In hypertrophy, provided no degeneration has set in, the cardiac walls appear either of normal color or of an unusually bright-red tint, and, as it were, more healthy and robust than normal, while the tissue feels very firm and resistant. Fatty degeneration may, however, give rise to various tints, as well as to diminution in consistence. In proportion to the dilatation the heart generally feels soft and flabby. 7. *Structural changes.* In the form of cardiac hypertrophy now under consideration the muscular tissue is increased. It has been held that the previously existing fibres become enlarged and lengthened; but it is far more probable that there is a new formation, the fibres being augmented in number, and arranged more closely together. Fatty degeneration frequently follows hypertrophy, and it has been supposed that the recently-formed fibres are more liable to this change. The coronary vessels become enlarged, and some believe that the nerves and nerve-ganglia are also increased in size; others think that there is only a hyperplasia of the connective tissue associated with these. The valves may become hypertrophied in the same ratio as the muscular tissue.

According to the cause of the morbid changes, enlargement of the heart may be general; limited to the left, or less commonly to the right side; to one cavity, especially a ventricle; or even to particular portions of this. As a general statement it may be affirmed that the left side of the heart is more liable to hypertrophy; the right to dilatation. The auricles are probably never solely hypertrophied, being always dilated as well.

SYMPTOMS.—It is for many reasons difficult to indicate precisely what symptoms are directly due to hypertrophy and dilatation, and on this part of the subject it must suffice to state the main general facts.

1. Pure hypertrophy, provided it is strictly compensatory and no more, may be unattended with any symptoms whatever.

2. In many cases, however, the hypertrophy is excessive, and thus gives rise to sensations of the increased action, both in the heart and in the arteries; as well as to signs of active congestion of the systemic circulation, especially that of the brain, or of the pulmonary circulation, or both, according as the hypertrophy is left, right, or general; these symptoms being aggravated by anything which excites the heart, such as a little exertion. The undue distension of the arteries resulting from excessive hypertrophy ultimately leads to their degeneration, and it certainly may cause rupture of the cerebral vessels with consequent apoplexy. It is believed that the pulmonary vessels may undergo degeneration from the same cause, and that they also may give way.

3. If the hypertrophy is insufficient, or is associated with dilatation or degeneration, then the symptoms are more marked. In the first condition there is palpitation, with dyspnœa, especially after any exertion, and now and then irregularity or intermittency of the heart's action. Degeneration is indicated by feebleness of circulation, and a tendency to syncope. Dilatation will be considered in a separate paragraph.

4. In proportion to the amount of dilatation will the functions of the heart be disturbed so that it becomes more and more difficult to carry on the circulation, which is retarded and rendered languid, and thus the mass of the blood is insufficiently aerated, while the capillaries and veins are overloaded and the arteries imperfectly filled. Most uncomfortable sensations are often experienced over the cardiac region, which may amount to intense anginal pains. Palpitation, irregularity, or intermittency are either constantly present or are brought on by slight causes, especially by any exertion or flatulence. Dyspnœa is also persistent to a greater or less degree, being easily intensified, and often amounting to orthopnœa; while all the consequences of pulmonary congestion are very liable to arise. The symptoms indicative of general venous congestion are present to their fullest extent when there is much dilatation of the right cavities. It is important to notice that while in hypertrophy the urine is unaltered, in proportion to the dilatation it becomes more scanty and concentrated, and usually contains albumen, which may amount to one-eighth or one-sixth its bulk.

PHYSICAL SIGNS.—In the following description an attempt is made to indicate the chief variations which may be met with.

1. Bulging over the cardiac region is observed in proportion to the degree of hypertrophy; to its duration; and to the youth of the patient; its seat and extent depend upon those of the hypertrophy. The spaces may be widened, but are not protruded. Dilatation does not cause bulging.

2. The impulse is much altered. In hypertrophy it is usually dis-

placed down and to the left, sometimes reaching to the seventh or eighth space, and three inches or more to the left of the nipple; somewhat increased in area, but well-defined and limited; forcible, in some instances being extremely powerful; slow, impulsive, heaving or pushing in a downward direction; and regular. Dilatation tends to enlarge the impulse transversely, especially towards the right, but does not lower it; it becomes extensive, diffused, and ill-defined; liable to change its place with different beats of the heart; more or less feeble, being sometimes seen when not felt, or neither perceptible to touch nor sight; of jerking or slapping quality, or occasionally almost undulatory; unequal in force and irregular in rhythm; or even intermittent; sometimes double, or with a diastolic impulse. It will be readily understood that according to the degree in which hypertrophy and dilatation are combined will the impulse partake of the characters of one or the other. Further, the part of the heart involved will influence it. When the right side is affected, the chief impulse lies behind and to the right of the sternum and ensiform cartilage, or in the epigastrium; and it appears superficial. Hypertrophy about the base of the heart may originate an impulse in this situation, and if either auricle is enlarged, auricular pulsation may be felt over the corresponding region. Valvular diseases and fatty degeneration frequently affect the impulse associated with enlarged heart.

3. Cardiac dulness. In all forms of enlargement this is necessarily increased, but it is important to notice in what directions the increase takes place, and the shape of the dulness. Hypertrophy generally enlarges it downwards and to the left, and causes it to assume a vertically-elongated form. Dilatation extends it transversely, especially towards the right, rendering it somewhat square or circular, but does not lower it. General hypertrophy with dilatation gives rise to the greatest enlargement, both laterally and downwards, the shape being more or less square. It is said that the dulness of hypertrophy is more marked than that of dilatation, and that the sense of resistance is greater, but these characters are by no means reliable. Enlargement of one or other side of the heart will cause the dulness to increase in a corresponding direction; while localized enlargement will give rise to localized dulness.

4. Cardiac sounds. In hypertrophy the first sound at the apex is obscure, muffled, low-pitched, and somewhat prolonged, the muscular element being in excess. In some cases there can scarcely be said to be a real sound, but rather a sensation conveyed to the head through the stethoscope, and occasionally a sound as of knocking against the chest-walls is heard. At the base the first sound may be much clearer and more valvular. The second sound is often well accentuated at the base, so as to resemble a first sound. In dilatation the sounds tend to be feeble, but clear, short, sharp, and valvular. The first sound be-

comes weaker towards the base, but the second may be well accentuated in this situation. A peculiar sensation is described in simple dilatation, which is communicated through the stethoscope, as of a diffused tumble of the heart against the chest-wall, with rolling over, followed by a pause, compared to "the sudden halt of strikers on an anvil" (Richardson); or "to a horse changing its feet while cantering" (Fothergill). Combined hypertrophy and dilatation cause the first sound to become extremely loud, full, prolonged, and accentuated, so as to be heard very extensively; if the valves are also hypertrophied, it may have a clanging quality. The sounds will be unusually plain towards the right or left, if either side is particularly affected; and right hypertrophy is attended with increased accentuation of the pulmonary second sound. Reduplication of the sounds is common in enlargement of the heart.

5. Murmurs occasionally result from enlargement of cavities, as already explained. Hypertrophy with dilatation will intensify murmurs due to valvular diseases; and the latter will necessarily modify the sounds above described.

6. An enlarged heart may cause displacement of neighboring structures. The lungs, especially the left, may be pressed upon, dulness and feeble respiration at the base being thus originated. The diaphragm, liver, and stomach, may also be depressed.

7. Pulse. In hypertrophy involving the left ventricle, the larger arteries are generally seen to throb more or less violently, and sometimes the smaller vessels also. The pulse is disposed to be less frequent, slow, and prolonged, full, tense, powerful, heaving, incompressible, and regular, having the characters known as constituting the "hammering" pulse. A sphygmographic curve presents a more or less square summit. In proportion to the amount of dilatation the pulse tends to become more feeble, small, compressible, lagging, and irregular or intermittent. When the right side is alone involved the radial pulse is not affected, or only to a less degree, and this may be of assistance in diagnosis.

III. ATROPHY OF THE HEART.

ETIOLOGY.—Atrophy of the heart may be met with under the following circumstances: 1. As a congenital condition, especially in females. 2. In connection with general wasting from old age, starvation, low fevers, phthisis, cancer, and other affections inducing marasmus. 3. From pressure upon the heart by pericardial agglutinations or effusion, or excessive accumulation of fat. This cause acts partly by interfering with the supply of blood. 4. As the result of disease or obstruction of the coronary arteries, the heart being therefore imperfectly nourished, and the atrophy is then generally accompanied with degenerative changes.

ANATOMICAL CHARACTERS.—Diminution in weight is the characteristic feature of cardiac atrophy, and this may be reduced to $3\frac{1}{2}$ ounces, or even less. As a rule the heart is small, and its cavities are contracted, the shape being normal. An eccentric form is described, however, in which there is dilatation as well as atrophy. The muscular tissue is usually wanting in tone, and fatty degeneration is not uncommon.

SYMPTOMS.—Feebleness of the circulation is the only symptom which can be attributed directly to atrophy. When it follows pressure upon the heart or interference with its supply of blood, severe symptoms are often present, such as palpitation, dyspnoea, and general venous congestion; but these are not the immediate consequences of the atrophy. The *physical signs* are: 1. A feeble impulse, which may be raised. 2. Diminished area of dulness. 3. Weak or sometimes almost extinct sounds. 4. Pulse small, feeble, but regular.

IV. FATTY DISEASE OF THE HEART.

There are two distinct pathological processes in connection with the heart to which the term "fatty disease" is applied, each requiring separate consideration.

1. *Fatty Infiltration.*

ETIOLOGY.—This condition is observed: 1. As a part of general obesity, especially in elderly persons. 2. In individuals who have suffered from cancer, phthisis, and other wasting affections. 3. In connection with chronic alcoholism.

ANATOMICAL CHARACTERS.—There is an infiltration of the connective-tissue cells around and in the substance of the heart with fat, leading to a kind of "fatty hypertrophy." This commences under the pericardium, but it penetrates inwards between the muscular fibres, causing their degeneration and absorption, so that finally the affected portions of the cardiac walls may be almost or entirely composed of adipose tissue. The ventricles are chiefly affected, especially the right, and there is a particular tendency to the accumulation of fat along the sulci, and about the base and apex. The tissue is necessarily pale, soft, flabby, and lacerable.

SYMPTOMS.—Fatty infiltration may be suspected, but cannot often be positively made out. If considerable in amount, it is liable to be accompanied with uncomfortable sensations in the cardiac region; palpitation on exertion; shortness of breath; and a weak and languid circulation, leading to incapacity for any effort, chilliness of the extremities, and a tendency to giddiness or faintness. *Physical examination only* reveals a feeble impulse and sounds, and a weak, compressible pulse. Often, however, there is so much fat over the chest as to render the local signs mentioned quite unreliable.

2. *Fatty Degeneration or Metamorphosis.*

ETIOLOGY.—The pathological modes of origin of fatty degeneration of the cardiac walls are as follows: 1. In the large majority of cases it results from malnutrition, owing to some interference with the supply of blood through the coronary arteries. This may arise from atheroma or calcification of the vessels themselves; embolic obstruction; external compression, especially by pericardial thickening; or impairment of the force of the aortic recoil from any cause. A hypertrophied or dilated heart is very liable to degenerate, chiefly in consequence of inadequate blood-supply. 2. This disease is sometimes a part of a general tendency to fatty changes, these being observed at the same time in the kidneys, lungs, vessels, cells of the cornea, and other structures. They may be set up without any evident cause; or in connection with senile decay, alcoholism, gout, and lowering diseases, such as phthisis or cancer. Most authorities regard them as being the result of some unhealthy condition of the blood; but it has been suggested that the trophic nerves are at fault. Some are of opinion that the heart and other structures may become fatty in consequence of renal disease, which renders the blood impure. 3. More or less fatty degeneration is associated with fatty infiltration, and it may follow myocarditis. 4. The heart has been found to have undergone fatty degeneration in cases of poisoning by phosphorus, phosphoric and several other acids. 5. It has been suggested that disease of the cardiac ganglia and nerves may lead to fatty degeneration.

Predisposing Causes.—The most important of these are age, the disease being very uncommon in the young, and increasing in frequency after middle life to about the sixty-third year (Watson), after which it gradually becomes less common; the male sex; sedentary and indolent habits, especially when combined with overeating and drinking, fatty degeneration being hence said to be more common among the higher classes and in those whose occupations lead to the above habits, such as publicans or butlers; and the presence of gout or Bright's disease. Neither general obesity nor the opposite condition seems to have any influence.

ANATOMICAL CHARACTERS.—Fatty metamorphosis may be observed in a heart of normal size, or in one enlarged or atrophied. The ventricles are by far most frequently affected, especially the left, and the change may be seen over a considerable extent, or be limited to certain parts, if due to localized obstruction. It may commence primarily at either surface or deep in the walls.

The alterations in physical characters are marked if the degeneration is advanced. The color is paler and dull, either brownish-red, pale-brown, or presenting various "faded-leaf" tints, being sometimes actually yellow. These colors may be seen throughout, or merely in streaks.

The consistence is diminished, the tissue tearing and breaking down under pressure readily, and the cardiac walls occasionally resemble mere "wet brown paper." There may be a greasy feel, oil being yielded on pressure, or to the knife, blotting-paper, or ether.

The microscopic changes are characteristic, and may be observed before there are any alterations evident to the naked eye. At first the striae of the muscular fibres are merely rendered indistinct by fat-granules and oil-globules, being brought out again by ether. Gradually they become more and more obscured, until finally they disappear altogether, the fibres being made up entirely of fat. Some are of opinion that fat is formed between as well as within the fibres.

SYMPTOMS.—Undoubtedly fatty degeneration may exist without there being any clinical indications of this condition, or only such as are doubtful. Sudden death has occurred from this disease, when there had been no previous suspicion of anything being wrong. Cases, however, come under observation not uncommonly in which the diagnosis may be made with tolerable positiveness. As a rule the progress of the disease is very gradual and insidious. Most of the symptoms depend upon the feeble action of the heart.

Unpleasant sensations are frequently complained of over the cardiac region, and anginal attacks are very liable to arise. Palpitation is often felt during the progress of the degeneration, not, however, directly due to the diseased fibres, but to those which are unaffected, these being insufficient for carrying on the circulation. The principal disturbances of the cardiac action observed are infrequency, the beats being reduced to fifty, forty, thirty, twenty-five, or even less in a minute; feebleness, irregularity, and intermittency. Any exertion tends to increase the frequency, and to render the action very irregular.

The appearance of the patient may afford signs of the disease. There is not unfrequently a sallow earthy tint, combined with anæmia, or with lividity about the lips, and enlarged capillaries on the cheeks, both of which appearances I have seen well marked. Fothergill describes the skin as sometimes resembling discolored parchment, having a greasy feel and presenting changes in the epidermis. The tissues are generally flabby and wanting in tone. There are frequently evidences of degeneration in the vessels and other structures. Among these the *arcus senilis* has been considered of material diagnostic importance, especially when it is yellow, ill-defined, and passes into a cloudy cornea; but this is very questionable.

The patient feels weak and languid, deficient in vitality, subject to chilliness, and incapacitated for any exertion, which brings on shortness of breath, faintness, or actual syncope. Involuntary sighing is sometimes heard, and also the disturbance of breathing described by Cheyne.

Owing to the inadequate supply of blood to the nervous centres, im-

portant symptoms arise. The chief of these are habitual depression of spirits; irritability and moroseness; curious sensations in the head; disturbances of vision; feebleness of intellect, with failure of memory and inaptitude for thought; tremulousness and an unsteady gait; a tendency to sudden attacks of giddiness, which make the patient cling to the nearest object; restless and disturbed sleep attended with startings; and unusual sensations in the limbs. Sudden cerebral anæmia is very liable to occur, inducing syncope, apoplectiform or epileptiform attacks, or a combination of these conditions, which, however, are soon recovered from as a rule, and do not leave any permanent ill effects behind.

The digestive organs are generally out of order. A sensation of sinking in the epigastrium is often complained of. Sexual inclination and power are notably deficient.

It must be borne in mind that fatty degeneration may set in in connection with a hypertrophied or dilated heart or with valvular disease, and it will then modify the symptoms as well as the physical signs accompanying these conditions, especially adding to the difficulty in carrying on the circulation.

PHYSICAL SIGNS.—The only positive signs of fatty heart are these: 1. The impulse is feeble or absent, but if perceptible it is well defined. 2. The sounds are weak, especially the first, which may be almost inaudible, especially at the base, where it is weaker than at the apex. The second sound may be fairly accentuated. 3. The pulse is very feeble, small, and compressible; often infrequent, there being sometimes but one pulsation to two ventricular contractions; while it tends to be very irregular, and may become hurried paroxysmally, so as to be almost uncountable from its frequency and irregularity (Walshe).

COURSE AND TERMINATIONS.—Patients suffering from fatty heart may go on for years, but death is to be feared at any moment if the disease is advanced. The fatal termination may occur quite suddenly from syncope, usually after some effort; rupture of the heart, either sudden or gradual; cerebral anæmia; or gradually from asthenia, which may be attended with dropsy, but this symptom is often absent from first to last, even in extreme cases, and it is a question whether fatty disease alone can give rise to it.

V. DEGENERATIONS AND NEW FORMATIONS IN THE WALLS OF THE HEART.

In addition to the fatty degeneration just described it is requisite to mention the following: 1. Softening of the tissue of the heart in connection with low febrile conditions, especially typhus, typhoid, small-pox, scarlatina, and septicæmia from any cause. A form of simple softening has also been described, chronic in its course. 2. Fibroid

infiltration or degeneration, or so-called cirrhosis. This is localized, especially in the muscoli papillares, but it may form scar-like patches in the walls. In some cases it results from inflammation, but in others it seems to be a gradual change from proliferation of an imperfect fibroid tissue; or some believe there is an infiltration of material between the muscular fibres. 3. Calcification. 4. Syphilitic growths. 5. Albuminoid degeneration. 6. Cancer, which is extremely rare, being usually medullary and nodular. 7. Tubercle, also very rare. 8. Parasitic formations, viz., the cysticercus cellulosus and the echinococcus.

VI. CARDIAC ANEURISM.

By cardiac aneurism is meant a localized dilatation of the walls of the heart. It may involve the entire thickness, or the endocardium and contiguous muscular strata may be destroyed. The size and form of the aneurism vary much, but there are the two types of general and equable dilatation of a portion of the parietes; and the sacculated variety, the latter opening into the heart by a wide or narrow orifice. More or less stratified fibrin or coagulated blood is usually found in the sac, and it may be thus completely obliterated and cured. It is the left ventricle which is almost invariably affected, and more than one aneurism may be present.

Cardiac aneurism is almost always the consequence of some previous structural change in the ventricular walls, especially fatty or fibroid degeneration, inflammation, softening from any cause, rarely ulceration or rupture of the endocardium, or hæmorrhage into the walls. As a rule it is formed gradually, but may be developed suddenly from violent strain. Fibroid and other degenerative changes are likely to be increased, or to be subsequently set up at the seat of aneurism.

There are no reliable symptoms or signs of aneurism of the heart. Sometimes a localized pulsating prominence is observed, with a single or double murmur. Hypertrophy and dilatation are developed in time. Death may take place suddenly from rupture of the aneurism.

VII. RUPTURE OF THE HEART.

ETIOLOGY.—This rare lesion may be considered here, as the rupture is generally the result of some structural change in the cardiac walls, and probably even in traumatic cases they are never quite healthy. The more important morbid conditions which have been observed are fatty disease, especially degeneration; great dilatation, cardiac aneurism, abscess or gangrene, ulcerative or other destruction of the endocardium, hæmorrhage into the walls, calcification, and parasitic formations. Rupture may occur in connection with aortic aneurism or coarctation, but then the heart is probably always diseased as well. It

is almost invariably induced by some exciting cause, and is much more frequent in males and old persons.

ANATOMICAL CHARACTERS.—The size, shape, and other characters of the rupture vary considerably. On the whole it is much more frequent in the left ventricle, but traumatic rupture is more common on the right side. The direction of the laceration is generally parallel to the chief fibres of the heart.

SYMPTOMS.—These vary according to the mode in which the rupture takes place, and its dimensions. Death may be instantaneous, or very rapid after sudden insensibility preceded by a shriek. If this does not happen the important symptoms are, sudden extreme pain in the cardiac region, a sense of great oppression and dyspnœa, signs of intense shock and collapse, and interference with the cardiac action. Patients occasionally rally, and there may be repeated attacks, supposed to indicate rupture of successive layers of the heart's fibres. It is even stated that recovery may take place.

CHAPTER XXIII.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF CHRONIC CARDIAC AFFECTIONS.

I. DIAGNOSIS.

IN making a diagnosis with regard to affections of the heart, it is necessary to determine: 1. Whether there is any actual organic mischief, or merely functional disturbance, which gives rise to symptoms associated with this organ. 2. The nature, exact seat, and extent of any organic disease present, the main conditions to be borne in mind being—*a*, different valvular diseases; *b*, alterations in the size or capacity of the heart; *c*, changes in its walls; *d*, interference with its supply of blood; *e*, pericardial effusion or adhesion. It must be remembered that these lesions are often variously combined, and an endeavor should be made to determine the precise state of the structures in every particular mentioned. 3. The pathological cause of any existing lesion, if this can be discovered.

A separate account of the diagnosis of each disease would involve unnecessary repetition, and it will be sufficient to indicate the data on which this should be founded, these being: 1. The previous history of the patient, special inquiry being made with regard to acute rheumatism and violent exertion. It may also be of some help to note whether there is any family predisposition to cardiac disease. 2. The age, sex, and general condition, particularly observing whether there are signs of

degeneration. 3. The symptoms present, especially noting if the circulation is disturbed in any way and the phenomena resulting therefrom. 4. The physical signs detected. Physical examination is the only positive and reliable means of diagnosis, and daily experience enforces the importance of investigating the state of the heart in any case which comes under observation for the first time, and especially when examining for life insurance. The points to be attended to in this examination are: (i.) Whether there is any change in the shape or size of the chest over the cardiac region. (ii.) The characters of the impulse in every particular. (iii.) Whether any thrill or pericardial fremitus can be felt. (iv.) The position, form, direction, and extent of the cardiac dulness. (v.) The characters of the heart-sounds, these being compared over different parts of this organ. (vi.) Whether any pericardial or endocardial murmur can be detected, with the characters of such murmur. It is also requisite to examine carefully the arteries and veins, making use of the sphygmograph when necessary in connection with the former, and observing whether they present evidences of degeneration.

It is important to draw attention to the following facts: 1. The heart may be displaced by extrinsic conditions, thus presenting abnormal physical signs when it is not itself affected; while signs of organic disease may be modified by the state of contiguous structures. 2. Murmurs may belong to the inorganic class; or may be merely due to roughness of the endocardium, which is unattended with any danger. 3. The bulging and dulness indicative of pericardial effusion or cardiac enlargement may be simulated by excessive temporary distension of the right cavities of the heart; aneurism of the aorta; tumor, abscess, or accumulation of fat in the mediastinum; localized pleuritic effusion; consolidation or retraction of the anterior edges of the lungs, especially the left. 4. Organic disease, even of a serious nature, is not unfrequently unattended with any symptoms whatever; and there may be no distinctive physical signs, particularly in the early stage of degeneration. 5. Severe cardiac symptoms may be complained of, and there may even be marked objective disturbance of the heart's action, amounting to irregularity or intermittency, in connection with mere functional disorder. Much stress has been laid on certain points in making out whether local cardiac symptoms are due to organic mischief or not, viz., that mere functional disturbance is not increased by effort; is inconstant; and is usually brought on by some obvious exciting cause. My own experience would lead me to avoid placing any implicit reliance on such distinctions, except that grave disorder following slight exertion may be a useful sign indicative of degeneration.

II. PROGNOSIS.

Any organic affection of the heart should be regarded as serious, but numerous circumstances influence the prognosis, and every case has to

be considered in several aspects before a satisfactory opinion on this matter can be given. It must be premised that great care should be exercised against mistaking mere functional disorder for organic disease, and *vice versâ*, which might lead to a wrong prognosis in either direction, and it is therefore highly improper to attempt to found any conclusion on mere subjective symptoms.

The questions which have to be considered in any particular case of heart-disease are mainly these: 1. Whether there is any danger of sudden death? 2. What are the events likely to arise in the progress of the case, and the dangers to be feared? 3. Its probable duration. 4. Whether a cure is possible? In the following remarks an endeavor will be made to indicate the chief matters to be attended to in order to arrive at a conclusion on these questions; and to state the principal facts which experience has established.

1. The prognosis must necessarily be guided by the nature, seat, and extent of the disease or diseases present, the knowledge of these facts being of course founded on a satisfactory physical examination. Instances are met with occasionally in which a murmur arises from mere roughness of the endocardium; in such cases there is not much danger, except that the mischief might spread to the orifices and valves or their appendages. Any organic affection in connection with either orifice, inducing obstruction or regurgitation, is decidedly serious, but the dangers are very different at the different orifices, and depend upon their precise conditions. In estimating the probable evils, the effects of the various lesions upon the circulation must be borne in mind, as well as the secondary changes which they are likely to originate in the heart. With regard to sudden death, aortic regurgitation is the only form of valvular disease in which this event may be anticipated with any probability, but it is said to have occurred in exceptional cases of mitral regurgitation. Obstructive disease on the left side is only injurious by its "back-working," and its effects on the heart and circulation. Aortic obstruction often lasts a long time without producing any particular mischief; and cases of mitral constriction also frequently go on for a considerable period. Mitral disease is chiefly dangerous on account of its effects on the lungs. Tricuspid regurgitation is one of the most serious affections of the orifices, on account of the distressing symptoms by which it is certain to be followed in time, and often very speedily, through overloading of the venous circulation; but its course is frequently tedious, the patient leading a miserable existence. Pulmonary constriction acts in the same way. It will readily be understood that extensive or double disease at an orifice increases the gravity of the prognosis. As a rule also it is worse when two or more orifices are involved; but secondary implication of an opening sometimes gives temporary relief, as in the case of tricuspid regurgitation following mitral disease, which diminishes the severity of the pulmonary symptoms.

With regard to the question whether valvular disease is ever curable, I certainly have met with cases in which marked mitral constrictive murmur has disappeared completely in young persons; and though entire restoration to the normal condition is probably not possible, it is not unlikely that inflammatory deposits leading to both aortic and mitral obstruction may be partly absorbed or removed in course of time.

Hypertrophy in the majority of cases is decidedly a preservative or compensatory lesion, and consequently cannot be looked upon as of evil import. It is only dangerous when excessive, as then it may lead to rupture of vessels, especially if these are diseased, a condition which it tends itself to produce through constant over-distension; when on the right side it is further injurious through keeping up a constant state of active congestion of the lungs. Some are of opinion that hypertrophy may subside if the cause which has induced it can be removed.

Dilatation is a highly dangerous condition, and in proportion to its degree and to its excess over hypertrophy does the prognosis become worse. Sudden death may occur in connection with a weak, flabby, greatly dilated heart; while it materially augments the difficulties in carrying on the circulation, thus contributing to the development of dropsy and other serious symptoms.

Degeneration of the heart's walls, especially fatty disease, is another very grave lesion. It is when this condition sets in that the prognosis becomes so much worse in compensatory hypertrophy. Extensive fatty degeneration is one of the most frequent causes of sudden death from cardiac disease.

Pericardial agglutinations add much to the evils of other lesions, and tend to originate changes in the heart itself. I have observed some cases in which this condition seemed to have considerable influence in bringing about a fatal result in pneumonia.

In many cases these affections are variously combined, and the prognosis has then to be determined from a careful consideration of the exact lesions present.

2. The existing symptoms will influence the prognosis considerably. Severe anginal attacks; great irregularity or intermittency of the cardiac action; or a tendency to syncope or to apoplectic or epileptiform seizures increase the danger of a case very materially. When the general venous circulation becomes much interfered with and dropsy sets in, the duration is not likely to be very prolonged, but it is impossible to make any definite statement on this matter, as patients often linger on for a considerable time, and may even improve remarkably under appropriate treatment. It is important to notice further that acute pulmonary complications may arise and cause very severe symptoms, also much increasing the dropsy, so that the case appears to be approaching a speedy termination; but on the subsidence of these

complications great improvement may take place, the patient again going on for some time and sometimes even feeling better than before.

3. The cause of the mischief may influence the prognosis, as well as whether such cause is capable of being removed. For instance, improvement in valvular disease can only be hoped for when it results from acute inflammation; if induced by chronic and degenerative changes, matters always tend to become worse. As has been previously stated, some regard a certain degree of hypertrophy or even of dilatation as capable of being completely cured, if the cause can be removed.

4. The state of other organs and structures, especially of the lungs, kidneys, and arteries will considerably modify the prognosis in any given case, and hence their condition ought to be carefully investigated. If the vessels are much diseased the muscular tissue of the heart is very likely to undergo speedy degeneration.

5. Among general matters affecting the prognosis are the age of the patient; the family history, as indicating a tendency to death from heart-disease at any particular time; the social position and habits of the patient. It is only in young persons that curative changes can be at all expected. Those who are so circumstanced that they are able to live quietly, without either the anxiety or the labor arising from having to provide day by day for themselves and their families, and who can procure a suitable diet, have a much better chance of length of life than those not so fortunately situated. Laborious occupations are especially injurious. Continuance in injurious habits, such as intemperance or debauchery, will necessarily render the prognosis more unfavorable.

III. TREATMENT.

Very seldom can any hope be entertained of curing a chronic cardiac affection, but undoubtedly much may be done in the way of prolonging life; averting further mischief in the heart; warding off unpleasant or dangerous symptoms; and relieving such symptoms when they arise. After any acute affection involving the heart the patient should be kept strictly under observation until this organ has been restored to as normal a condition as possible; while any chronic case ought to be kept constantly under medical supervision. Different forms of heart disease require particular modifications in their management; but it will suffice here to point out the main principles which apply to all varieties more or less, and as occasion requires to call attention to any special treatment which needs comment.

1. General hygienic management is always of essential importance. A patient suffering from heart disease should, if possible, give up any laborious employment, especially if this has evidently originated and is increasing the mischief. At the same time a warning should be given

against all forms of severe exercise, especially such as involve sudden effort; it is well to give special instructions against running or walking hurriedly, or straining at stool. In some instances complete rest should be enforced for a time, which often produces a marked improvement in the state of the heart. Many cases, however, are benefited by more or less exercise, or at all events by being in the open air during some portion of the day, and carriage driving is often useful. Many patients are able to go about their usual avocations without any harm resulting, provided these are of a satisfactory character. The question of the amount of exercise to be permitted must be determined by the actual conditions present, and the effects which follow it; it may be stated generally that in proportion to the degree of dilatation or degeneration present is the capacity for effort diminished. These lesions, if extensive, as well as aortic regurgitation, imperatively forbid any great exertion. It is very important further to avoid all causes of mental disturbance. Anxiety and mental strain or excitement in connection with pecuniary matters, business, politics, or excessive study, and all strong emotions must be carefully shunned, and a proper amount of sleep should be habitually obtained. Warm clothing is requisite, but there must be no pressure or constriction about the chest or neck; cold sponging of the skin is often useful, if it is well borne. All injurious habits which depress the nervous energy of the heart must be prohibited, such as abuse of alcohol, tobacco, or tea, late hours, or venereal excesses; and close inquiry may be necessary with regard to various matters in order to detect such mischievous habits. Change of air to a moderately warm and rather bracing climate frequently proves beneficial.

2. It is most needful to attend to the diet in every particular, and to the state of the digestive organs. When there is degeneration of the heart a very nutritious diet is indicated, which should contain abundant protein elements, if these can be digested, but anything indigestible must be avoided. Milk and cream are exceedingly useful articles in many cases. With regard to alcoholic stimulants, no rule can be laid down, but a moderate amount is generally beneficial, and there are not unfrequently symptomatic indications calling for considerable quantities. The bowels should be kept acting regularly. Remedies for improving the tone of the stomach and relieving dyspeptic symptoms are frequently very serviceable, especially flatulence, which mechanically interferes with the heart's action.

3. If there is any constitutional diathesis, such as gout or syphilis, treatment directed against this is often beneficial. One of the most essential matters in many cases of cardiac disease is to look to the state of the blood, and should there be any indication of anæmia, to give some preparation of iron. Indeed, independently of this, this drug is frequently of considerable value, especially the tincture of steel. Other

tonics are useful in many cases, such as quinine and mineral acids, strychnine or tincture of *nux vomica*, especially if the heart is in a state of degeneration, or is wanting in tone.

4. Excellent therapeutic observations have been carried on during the last few years in order to determine the effects of certain powerful medicinal agents upon the heart. Of these digitalis requires special notice. Experiments have shown that the effects of digitalis upon the heart are not to paralyze it, as was formerly supposed; but to render the ventricular contractions more powerful and complete, less frequent, and more regular. Hence the periods of rest between the contractions are longer; the blood is driven more forcibly and in greater quantity into the aorta; the aortic recoil is promoted; and thus the nutrition of the cardiac walls improved (Fothergill).

There are considerable differences of opinion as to the cases in which digitalis is indicated, and as to its mode of administration. The following remarks may serve to convey the main practical facts with regard to the use of this drug, partly founded on the statements of others, partly on personal clinical observation.

(i.) In all cases in which digitalis is given its effects should be carefully watched, especially as regards the cardiac action; the state of the pulse; the urine; and any dropsy which may be present. When the action of the heart is rapid, irregular, ineffective, or embarrassed, the pulse being at the same time weak, the good results of the use of digitalis are seen in that it calms the heart and makes this organ act regularly and more vigorously, often relieving unpleasant local sensations, the pulse being at the same time improved, becoming less frequent, stronger, fuller, and more regular. Intermittency has been considered by some as contraindicating digitalis, but though more than usual caution is required under such circumstances, yet it may be given in many cases with excellent results, and Fothergill is of opinion that it sometimes indicates a necessity for increasing the dose. If it appears to induce irregularity or intermittency, with much feebleness of pulse, digitalis should be discontinued. The urine is often much increased in quantity by its use, but only if dropsy is present (Ringer). Should it become diminished, this is considered an indication for stopping the drug. Its diuretic action is presumed to be due to the force of the heart being increased, and through this the arterial tension in the kidneys, by which the flow of water out of the renal vessels is promoted. The influence of digitalis on cardiac dropsy is often most marked, but not invariably. As signs which suggest the discontinuance of digitalis may be mentioned exaggeration of unpleasant sensations about the heart, if evidently due to the drug; tendency to faintness; noises in the head; and persistent vomiting. It has been supposed to have a cumulative action, and may thus give rise to sudden symptoms of poisoning.

(ii.) The forms in which digitalis is given are chiefly as the tincture

or infusion, some preferring one, some the other. If the remedy is required to act rapidly upon the heart, and especially to diminish dropsy, the freshly-made infusion is certainly preferable; but the tincture is very useful for continuous administration. The powder of the leaves is also recommended when it is required to keep up the action for some time, and if it cannot be taken internally, external applications of poultices of the leaves or fomentations of the infusion may be beneficial, especially in promoting the flow of urine and diminishing dropsy. Digitalin has also been used, either internally or by subcutaneous injection. It is generally advisable to begin with a small dose (3ss.—ʒi of infusion, or $\text{ʒv}-x$ of tincture three or four times daily), and gradually increase the quantity as well as the frequency of administration according as circumstances indicate. Digitalis is advantageously combined with other medicines, especially iron, various tonics, and diuretics. It may be necessary to continue the medicine for a long period, even for years, but it has appeared to me that it is in some instances preferable to intermit its administration from time to time. In the less advanced cases it often brings about such good results that it can be left off for considerable periods, but it should be resumed as soon as there are any signs of disturbed cardiac action. In very advanced cases attended with general dropsy the drug may lose its power, and the dose has often to be increased considerably in order to produce any effect, which is a bad omen.

(iii.) The cases in which digitalis is indicated or the reverse must now be noticed. Simple hypertrophy of the left ventricle only requires it when excessive, and when the heart is acting tumultuously; or when the hypertrophy is insufficiently compensatory. The dose should be very small, and the effects closely watched, as symptoms of poisoning may speedily arise in these cases. In proportion to the degree in which dilatation becomes evident, and the heart's action is consequently inefficient, does the drug generally become more valuable, much larger doses being required and being well borne. Mitral disease and the changes in the heart resulting therefrom are greatly benefited as a rule, the pulmonary and other symptoms associated with these conditions being also effectually mitigated. It is especially when there is great irregularity that digitalis proves so serviceable, and Ringer believes that the drug causes the muscoli papillares to act more regularly, thus checking regurgitation which depends upon their disturbed action. Many object to the use of digitalis when the aortic orifice is involved. I quite agree with those, however, who do not look upon this as a contraindication, provided the state of the ventricle is such as to require it, having frequently seen marked benefit follow its administration, but these cases must be closely watched. The conditions due to enlargement of the right heart with tricuspid regurgitation, when this lesion exists alone as the result of pulmonary disease, are not improved by

digitalis unless there is irregularity in the cardiac action, and the drug may even do harm; when these morbid changes follow mitral disease, however, much good may be effected by its use.

Fatty degeneration is also looked upon by many as contraindicating digitalis, but with due precautions I am convinced that it may be given with undoubted benefit when this condition is present, should it be called for, and it then probably acts by aiding the contraction of those fibres which are still healthy. Extensive atheroma has likewise been regarded as forbidding the employment of this drug, and it certainly ought to be used with particular care when the arteries are much affected. Bronchitic attacks associated with heart-disease may be often much relieved by the use of digitalis, should there be palpitation, irregularity, or other signs of cardiac embarrassment and inability. Its value in functional palpitation has already been alluded to.

Several other remedies influence the heart, viz., aconite, belladonna, (both of which are very valuable in calming this organ when it acts excitedly and violently), hydrocyanic acid, veratria, caffein, scoparium, and squill. Some of these require to be given cautiously, as they are powerful agents.

5. Important questions suggest themselves, as to whether any means are known capable of restoring the heart to its normal condition when in a state of disease; and whether it is desirable to use such means? As regards valvular diseases, it is useless to attempt to influence these by any therapeutic measures. With respect to the diminution in size of a hypertrophied heart, this is certainly not what ought to be aimed at, and it is more than doubtful whether it can be effected in the least; such means towards this end as repeated local bleedings, low dieting, severe purgation, and large doses of iodide of potassium, are decidedly to be condemned, and the great object should rather be to maintain the nutrition of the heart as much as possible, and prevent it from becoming dilated or undergoing degeneration. There are no direct means of influencing dilatation, except by improving the tone and vigor of the heart by food, tonics, and digitalis. It is quite possible that the nutrition of a fatty heart may be improved in some instances by good diet, tonics, and cod-liver oil.

6. Various symptoms are liable to arise in the course of a case of heart-disease, demanding measures for their relief. Those more immediately connected with the heart are pain and other unusual sensations; palpitation; angina pectoris; and faintness or syncope. Abnormal sensations are often much relieved by wearing a belladonna plaster, and many patients are never comfortable except when they have one applied. Sometimes belladonna liniment is very useful. The treatment of the other symptoms has been already pointed out. With regard to palpitation attended with dyspnœa, this is in some instances much quieted by the subcutaneous injection of a very small quantity (gr. $\frac{1}{2}$ to $\frac{1}{4}$) of

morphia, which is supposed to relieve spasm of the arterioles, this giving rise to the palpitation (Fothergill). Aconite in minute doses is also recommended strongly by Ringer and others. Pulmonary symptoms must be treated by the usual remedies, but they are often greatly relieved by digitalis. Needless cough should decidedly be subdued, though it is frequently necessary to promote expectoration. Cardiac dyspnoea may in many cases be relieved by digitalis, or may require various sedatives and antispasmodics. Any obvious cause giving rise to this symptom, such as flatulence, should be at once got rid of, and it is generally diminished by enabling the patient to sit up in bed, thus removing any pressure on the diaphragm from below. Hæmoptysis occurring in heart disease should not be rashly stopped, provided there is not sufficient loss of blood to injure the patient, as it may afford considerable relief.

Local remedies are often serviceable in the treatment of heart and lung symptoms, such as dry-cupping, hot or turpentine fomentations, and sinapisms. Some recommend irritation along the course of the vagus nerve by means of sinapisms or gentle galvanism. In cases where the symptoms are severe, and there is evidence that the right cavities of the heart are greatly over-distended, removal of blood may prove decidedly serviceable for the time, either by venesection, local cupping, or application of leeches; but it must be remembered that this measure tends to induce anæmia, and to impair the nutrition of the heart, and thus may ultimately do more harm than good, so that the conditions should be carefully considered in every instance before proceeding to its adoption.

Dropsy is a symptom which sooner or later sets in in a large proportion of cases of heart disease. In its treatment those diuretics are most beneficial which act upon the heart and thus increase the arterial tension in the kidneys, especially digitalis. Well-diluted gin, hollands, and whisky are also useful as diuretics. Vapor, hot-air, or even Turkish baths are highly beneficial when they can be borne, and with due precautions they may be persevered in for some time. I have frequently found much benefit from local baths, by wrapping up the legs in warm fomentations along their whole extent and covering them with mackintosh. It has also been recommended to excite the skin into activity by surrounding the patient with hot-water bottles while in bed. Purgation is often attended with beneficial results, but this mode of treatment requires care, on account of the depression which may thus be induced. Frequently it is not desirable to check diarrhoea in these cases, as it helps to unload the vessels, and it may be allowed to continue provided the patient is not evidently lowered from its excessive amount. With respect to operations for the removal of cardiac dropsy, if it does not soon yield to proper treatment acupuncture should be decidedly resorted to, in my opinion, for I have often observed great

relief from the adoption of this measure. Of course due regard must be paid to position and cleanliness.

Much difficulty is frequently experienced with regard to procuring sleep in advanced cases. Opiates, hydrate of chloral, and other remedies of this class are frequently inadmissible, as they would induce a condition in which the voluntary efforts necessary for carrying on respiration are suspended, and death might speedily ensue. Still it may be justifiable under such circumstances to try small injections of morphia, and stimulants should be given freely. When the patient becomes semicomatose from carbonic acid poisoning, the bladder must be regularly emptied.

7. It is necessary to attend to the state of the other principal organs of the body when the heart is affected, and as far as possible to prevent them from becoming involved, especially the lungs, kidneys, and liver. Every source of cold should be particularly avoided, and the slightest pulmonary complaint treated immediately. An occasional dose of some medicine which acts upon the liver may be useful.

CHAPTER XXIV.

MALFORMATIONS OF THE HEART AND GREAT VESSELS— CYANOSIS—BLUE DISEASE.

THE term *cyanosis* merely indicates a certain appearance presented by a patient, which is especially observed in connection with malformations of the heart and great vessels, but is often associated to a greater or less degree with other affections which obstruct the circulation and interfere with the due aeration of the blood.

ETIOLOGY.—The *pathological causes* of cardiac malformations are in the great majority of cases either arrested development, or endocarditis or myocarditis occurring during intrauterine existence, which is by far more common on the right side, especially in connection with the pulmonary orifice. Possibly some forms may in very exceptional instances be acquired after birth, in consequence of the rupture of a septum.

ANATOMICAL CHARACTERS.—The following are the chief morbid conditions met with in the heart and great vessels which come under the class of *congenital malformations*, excluding some which are merely of anatomical interest and do not give rise to any ill effects :

I. CARDIAC.—1. Patent foramen ovale, or even complete absence of the auricular septum. 2. Perforation or incomplete development of the ventricular septum. 3. Owing to the above-mentioned conditions there

may be but one auricle or ventricle; or sometimes an auricle and ventricle are thrown into one; or there may even be scarcely any separation between any of the cavities. 4. Extreme smallness of the right ventricle, either from the septum lying too much in this direction, or from cicatricial thickening and stricture. This condition is very rarely observed on the left side. 5. Constrictive disease of the tricuspid orifice or contraction of the valves, leading to obstruction or regurgitation; the same conditions are said to be met with, but only extremely exceptionally, in the mitral orifice.

II. VASCULAR.—1. Constriction or incomplete development of the pulmonary artery. In an interesting case which came under my notice, only the right branch existed, which was quite pervious, but the valves were extensively diseased and calcareous, the left lung being completely collapsed and disorganized. 2. Constriction of the aorta. 3. Transposition of the arteries, the aorta coming from the right ventricle, and the pulmonary artery from the left. 4. Both vessels may spring either entirely or partially from the same ventricle, owing to displacement or imperfection of the septum. 5. Occasionally there is but one arterial trunk, which comes from a single ventricle and then divides into two. 6. The ductus arteriosus is often pervious.

Some of these conditions are met with together, being in fact the necessary consequences of each other. Thus the most common malformation observed, is constriction of the pulmonary orifice, with an open foramen ovale and a pervious ductus arteriosus, through which the blood passes from the aorta into the pulmonary artery, some of it also reaching the lungs through enlarged bronchial arteries. If the aorta is closed, the foramen ovale and ductus arteriosus also remain open, the blood being conveyed by the latter from the pulmonary artery into the aorta.

SYMPTOMS.—It will be noticed on studying the changes mentioned, that they may disturb the circulation in one or more of three ways, viz., 1. By allowing a free intermixture of venous and arterial blood. 2. By obstructing the circulation, especially interfering with its passage into the lungs, the venous system being overloaded, or with its return from these organs. 3. By rendering the systemic circulation entirely venous, the pulmonary entirely arterial, in consequence of transposition of the arteries. Some of the malformations are quite incompatible with life for any length of time. In other cases patients may live for many years, even up to twenty or more, and the symptoms may not declare themselves for a considerable time after birth. These symptoms are simply such as are associated with deficient blood-oxygenation and general venous stagnation, which have already been fully considered (pages 465, 466), and which are presented in some forms of malformation in their most intense degree. The color of the surface may be blue, leaden, purple, livid, or of a clarety hue, often mottled, and it is very

marked in the lips, ears, fingers, and toes. It is intensified by anything which increases the difficulty in carrying on the circulation, such as crying or coughing. The cause of this discoloration has been much discussed, but it is probably the combined effect of intermixture of venous and arterial blood; venous stasis; and imperfect arterialization. Fits of palpitation are common, often with extreme irregularity and a disposition to syncope or coma. Dyspnœa, cough, and other lung symptoms are also frequent, these organs being liable to various morbid changes.

The *physical signs* will vary much according to the morbid condition present. If the orifices or valves are affected there will be corresponding murmurs, and a pulmonary murmur is most common in these cases. It is questionable whether a patent foramen ovale can give rise to a murmur. In time signs of hypertrophy and dilatation or degeneration are very likely to be observed.

The duration of cases of congenital cyanosis is very variable, and patients sometimes linger for a long while, apparently becoming accustomed to their semi-asphyxiated state. Death never takes place suddenly, but usually gradually, being hastened, however, by pulmonary complaints, nervous disorders, and other causes.

TREATMENT.—All that can be done is to attend carefully to hygienic measures, including moderate exercise, baths with friction, and the wearing of warm clothing with flannel next the skin; to give plenty of good food, especially of a hydrocarbonaceous kind, including a small quantity of some alcoholic stimulant; and to treat any condition calling for special attention. Iron and other tonics, with cod-liver oil, are often beneficial. A dry warm climate is desirable, and every source of cold must be avoided.

CHAPTER XXV.

DISEASES OF THE ARTERIES.

1. **ACUTE ARTERITIS** is chiefly observed in connection with the aorta (aortitis), and probably it occurs in the course of blood-diseases more frequently than is generally recognized. It is characterized anatomically by injection of the vasa vasorum; thickening and softening of the coats of the artery; cloudiness and loss of polish of the inner surface, which becomes rough from fibrinous deposit.

SYMPTOMS.—The symptoms which have been described in connection with aortitis are pain over the vessel, sometimes extreme, accompanied with much tenderness or superficial hyperæsthesia; a sense of heat and throbbing; severe constitutional disturbance and restlessness; some-

times a tendency to syncope; and dread of death. The *physical signs* are objective pulsation, with occasionally a thrill and murmur synchronous with the cardiac systole. In the smaller arteries inflammation might lead to complete plugging; but a clot may be the cause of inflammation.

2. CHRONIC ARTERITIS is an important morbid process, and is now generally looked upon as originating the condition known as *atheroma*, this being preceded by a parenchymatous inflammation affecting the inner coat—*endarteritis deformans*.

ETIOLOGY.—The chief causes of chronic arteritis and consequent *atheroma* are: 1. Local injury from distension of, and strain upon, an artery, it being thus frequently due to hypertrophy of the heart. 2. Constitutional diseases, viz., gout, rheumatism, syphilis. 3. Abuse of alcohol. 4. Senile degeneration.

ANATOMICAL CHARACTERS.—In the first instance the deeper layers of the inner arterial coat become infiltrated with new cells, softened, relaxed, and thickened. The cells are probably mainly derived from proliferation. As the result of this process thickened patches or more extensive tracks are observed over the inner surface of the artery, and two forms are described, supposed by some to be merely stages of the same process, viz., those which are soft, jelly-like, moist, and pale-reddish; and more firm, semicartilaginous or horny, raised patches, translucent, but more opaque in the deeper layers, and compared in appearance to boiled white of egg (Niemeyer). The superficial portion of the coat is unaffected, and can be stripped off. More or less rapidly fatty degeneration sets in, this beginning in the soft form chiefly in the superficial layers; in the cartilaginous variety in the deeper layers. In some cases degeneration takes place very speedily, owing to the abundance of cells, and a yellowish, soft, pultaceous substance is formed, like a greasy paste, this giving rise to a sort of pseudo-abscess or *atheromatous pustule*, which may ultimately burst into the artery; at first merely a small hole is formed in the inner coat, through which the soft contents escape and are carried away by the blood, but finally an *atheromatous ulcer* is formed, varying in size and depth, sometimes extending down to or even involving the middle coat. The softened material consists of broken-down fibres, granular cells, abundant fat-granules, and crystals of cholesterin. In other cases, where the process is more chronic, the substance is firmer, becoming caseous; and in others more chronic still, partial organization takes place, leading to fibroid thickening, but this is always accompanied with some degeneration. Ultimately calcification is very liable to happen; or as some suppose, actual ossification, hard depressed plates being thus originated, or the smaller arteries may be involved in their entire circumference and converted into rigid tubes. The calcareous plates are at first covered by the superficial portion of the lining membrane, but this is

liable to give way, leaving a rough surface exposed, upon which fibrin is then very apt to be deposited.

The vessels affected, as well as the extent over which the changes are observed, vary widely, and different stages are usually seen in the same case. These changes are most marked in those parts of the vessels which are subject to the greatest strain, especially the ascending and transverse portions of the arch of the aorta, and around the openings of arteries which come off laterally, such as the intercostals. As a rule antheroma is more advanced in the aorta than in the arteries generally.

As regards inflammation of the other coats of arteries, the external coat is sometimes involved by extension from neighboring structures, especially chronically, and this leads to thickening and induration. The middle coat is occasionally specially involved, and a small abscess or pustule may form in it.

3. **FATTY DEGENERATION.**—Fatty degeneration of arteries is an entirely distinct process from that constituting atheroma. It begins generally in the superficial part of the inner coat, but may extend into the middle coat or implicate this originally. The epithelial and connective-tissue cells of the inner coat are directly changed, becoming more or less filled with fat-granules, but in the middle coat the muscular fibres undergo degeneration. The usual appearances are those of small, scattered, irregular, opaque, yellowish-white patches, quite superficial, only very slightly projecting, and being easily removed, leaving normal tissue underneath. As the deeper layers become involved the patches appear more opaque and irregular, and are less easily stripped off. In course of time complete destruction and softening may take place, nothing but fat-granules remaining, which are carried away by the blood, leaving irregular superficial erosions. Finally calcification may be set up. The capillaries are also liable to become the seat of this fatty degeneration.

4. **ATROPHY.**—Occasionally a large artery, especially the aorta, undergoes simple atrophy, the walls becoming gradually thin.

SYMPTOMS AND EFFECTS.—The consequences of the various chronic changes described are very similar, and they are of considerable importance, often giving rise to symptoms connected with various organs, and leading to serious lesions of structure. Here it need only be indicated in a general way what these effects are, and they may be thus stated: 1. The elasticity of the arteries is more or less diminished, until finally it is completely lost; their resistance is increased; and they are ultimately converted into rigid tubes, at the same time their calibre being diminished. Hence an obstacle to the circulation arises, which leads to hypertrophy of the left ventricle; this, however, tending to be speedily followed by degeneration. The circulation in the different organs is impeded, and among the most frequent symptoms result-

ing therefrom are those indicating disturbance of the cerebral circulation, especially giddiness and disorders of the special senses. Owing to the impairment of nutrition, structures are very liable to undergo degeneration and to become inflamed from slight causes. 2. When the vessels are roughened on their inner surface, fibrin is often deposited from the blood, which may ultimately cause their complete obstruction. As a consequence softening or death of a part may ensue, as is well seen in chronic softening of the brain and dry gangrene of the lower extremities. 3. A portion of an artery, especially after the formation of an atheromatous ulcer, is very prone to yield gradually, an aneurism being thus originated. 4. The affected vessels become brittle, particularly when calcified, and thus they are more easily ruptured, giving rise to cerebral apoplexy most commonly. 5. Fragments of the degenerate structures or of fibrinous deposits may be detached, carried away by the blood current, and lodged in some smaller vessels as emboli. 6. Physical examination of the arteries reveals that they are visible, tortuous, and locomotive, and that they feel more or less hard, full, incompressible, cordlike, or rigid. A sphygmographic tracing is characterized by the large dimensions of the curves: the approximation of the secondary waves to the summit; and the great size of the first secondary wave as compared with the aortic, the latter being much diminished.

When the arch of the aorta is extensively diseased, especially calcified, a jerking impulse may be observed above the sternum, and occasionally a thrill; while a rough systolic murmur may also be heard along the course of the vessel, or a cardiac basic murmur is intensified in this direction. The artery is often somewhat dilated at the same time, and this will increase the signs mentioned.

DIAGNOSIS.—Degeneration of arteries should be always looked for in persons at all advanced in years, and it should be kept in mind as a probable cause of many symptoms of which they complain. Examination of the vessels is the only satisfactory means of diagnosis, and if the general arteries are affected, probably the aorta will be in the same condition. Some attach considerable importance to the sphygmographic tracing as revealing an early stage of degeneration.

PROGNOSIS.—This merely involves a knowledge of the dangers which accompany degeneration, so that they may be guarded against. Many live to a good old age with the vessels much diseased, but at any moment there is a liability to dangerous lesions. The earlier the degeneration comes on the more serious is the prognosis.

TREATMENT.—All that can be done is to avoid everything which is likely to throw a strain upon the vessels; and to maintain the nutritive activity of the system as much as possible by diet, tonics, and cod-liver oil, the last being often decidedly useful. Any constitutional diathesis must be attended to, and all injurious habits checked.

THORACIC ANEURISMS.

Aneurisms come more especially under the care of the surgeon, and therefore for a full consideration of the subject reference must be made to surgical works. In this article it is only intended to allude to the main practical facts connected with aneurisms within the chest, especially aortic.

ETIOLOGY.—Aneurism almost always results primarily from some morbid change in the walls of an artery, especially chronic endarteritis and the atheromatous changes connected therewith, but also sometimes from fatty degeneration or simple atrophy. Its determining cause is generally some more or less violent exertion, which throws a sudden or frequent strain upon the weak portion of the vessel, and may even lead to a rupture of part of its coats.

Aneurism is much more common among males, especially those whose occupation entails violent efforts, and about the middle period of life. It is comparatively extremely frequent in the army; and this has been attributed to the combined effects of great exertion, tight clothing, which compresses the neck and chest and obstructs the circulation, and heavy accoutrements. The diseases which predispose to changes in the vessels, such as syphilis, gout, and rheumatism, may be considered as *predisposing causes* of aneurism, especially syphilis. It has been stated to be occasionally hereditary, but this is probably only true as regards the degeneration of the vessels.

ANATOMICAL CHARACTERS.—The following varieties of aortic aneurisms are met with: 1. There may be a *general dilatation* involving the whole circumference, and either cylindrical, fusiform, or very rarely globular in shape. 2. *Sacculated aneurism* is the most important, in which there is a lateral bulging or sacculation of a portion of the circumference, the coats being either entire—*simple* or *true aneurism*; or more or less of the inner and middle coats being destroyed—*compound* or *false aneurism*. Sometimes all the coats give way, and the aneurism is bounded only by surrounding structures—*diffuse aneurism*. 3. In extremely exceptional cases a *dissecting aneurism* is observed. The ascending portion of the arch is most frequently affected, especially on its convex side, where the aorta is most exposed to strain; an aneurism may exist, however, on any part, even between the pillars of the diaphragm. Great variety is presented as to size, exact shape, contents, and other characters.

SYMPTOMS.—The symptoms of aortic aneurism are far from uniform, being chiefly due to pressure on surrounding structures (as described in pages 468, 469), and therefore influenced by its situation, size, form, rapidity of formation, and direction of growth; being also liable to alter during its progress. The symptoms are by no means in proportion to the external physical evidences of aneurism; indeed the reverse

is often true, because the more an aneurism tends in an inward direction the more severe are the symptoms likely to be, and they may be extremely aggravated when it is impossible to detect any enlargement by physical examination. In some cases there are no symptoms or signs from first to last. Abnormal local sensations are usually present, such as pain, varying in characters and intensity, heat, fulness and weight, or throbbing; while tenderness is common. If the aneurism passes backwards the pain may be deep and gnawing or grinding, owing to destruction of the vertebræ. Among the most frequent pressure-symptoms are those indicating interference with the main air-tubes, which in many cases first attract attention. The constitution often suffers markedly, even though there are no particular local symptoms or signs, and I have sometimes observed a very striking appearance of illness combined with anæmia or a sallow cachectic look, with an anxious, distressed, or irritable expression, but without any particular emaciation, which has led me to suspect internal aneurism when there was no evident cause to account for these phenomena. The posture assumed by patients suffering from aortic aneurism depends upon its position and other circumstances; as a rule they cannot lie down, but keep the head high, and some have a tendency towards a prone position, so as to take off pressure from the structures behind; bending the head forward and then throwing it back suddenly is considered a movement suspicious of aneurism. The digestive organs frequently suffer. Head-symptoms are also common, with disturbed sleep. The urine is not altered. Aneurism may give rise to embolism in some distant organ, especially in the brain.

PHYSICAL SIGNS.—The following include the physical signs which are to be looked for as indicative of aneurism, but not uncommonly they are very obscure. 1. Local bulging, its site depending upon the part of the aorta involved. If the arch is affected in its ascending or transverse portion, the prominence will be in front, opposite or to the right or left of the upper part of the sternum, the exact situation differing much. Aneurism of the remainder of the arch or of the descending aorta may give rise to bulging posteriorly, generally to the left of the spine, occasionally to the right, and it is sometimes very extensive. In shape the swelling tends to be conical, and it involves the ribs and spaces equally. 2. Pulsation over the swelling, synchronous with the ventricular systole usually, but sometimes double, or it may be more marked during the diastole. The systolic pulsation is usually expansile and heaving or throbbing. Sometimes it is distinctly undulatory. In exceptional instances a thrill is felt. It is important to observe that the stethoscope may aid in discovering slight pulsation when it cannot be detected by the fingers. 3. Dulness corresponding to any bulging, but frequently extending beyond this to a variable degree and across the middle line, or being observed when there is no actual prominence, of

a dull, dead, putty-like character, and accompanied with increased resistance. 4. Auscultation gives extremely variable results. There may be nothing whatever heard, or only indefinite sounds. The important auscultatory sign of aneurism, however, is the presence of a rough murmur, usually systolic, occasionally double, or very exceptionally only diastolic. 5. There may be signs of hypertrophy of the left ventricle, but in most cases in which the heart is affected it is merely displaced down and to the left. If the aneurism lies behind, the heart may be so pushed forward that the chief impulse is observed at the base. 6. Examination of the larynx and lungs might reveal functional disorder or organic mischief in the former; displacement of and interference with the entrance of air into the latter; or bronchial catarrh on one or both sides. 7. The radial pulse often affords important signs, especially to the sphygmograph. The chief characters are that the pulse is delayed on one side; or that it differs in fulness and force on the two sides. The sphygmograph reveals even a slight difference in the two pulses, but this is very marked in some cases. The diastole is often influenced also, and, when the descending aorta is involved, this may be much increased, especially on the right side. An aneurism is capable of influencing the pulse by its own direct effect upon the circulation; and also by obstructing the main arteries in consequence of pressure, closure of their orifices by a clot, or torsion.

MODES OF TERMINATION.—Death is the ordinary termination of aortic aneurism, and it may be immediately due to—1. Gradual asthenia. 2. Effects of pressure. 3. Rupture and hæmorrhage, which may take place into the pericardium, heart, neighboring great vessels, pleura, mediastinum, trachea or either bronchus, lungs, œsophagus, spinal canal, or externally. 4. Independent affections, either acute or chronic.

DIAGNOSIS.—It would be easy to write to almost any extent on the difficulties which might and do arise in the diagnosis of thoracic aneurism, but it must here suffice to offer a few general observations on the subject. It is not only necessary to determine the presence of an aneurism, but also its seat, variety, size, and other characters as accurately as possible. In some cases the signs are so evident, that there is but little difficulty in making out all that is required; but the following classes of difficulties are met with, viz.: 1. There may only be symptoms indicating more or less pressure within the thorax; or sometimes merely obscure and ill-defined sensations, with constitutional disturbance, but no external signs. 2. An aneurism may give rise to the physical signs of a tumor, but without any pulsation or murmur. 3. Other pulsating prominences are occasionally observed besides aneurisms, the pulsation being usually transmitted from the heart or aorta.

The chief morbid conditions which aortic aneurism is liable to simulate, or *vice versâ*, are a solid mediastinal tumor or abscess, the latter occasionally presenting pulsation; pulsating empyæma; phthisical con-

solidation at the left apex, with subclavian or pulmonary murmur; swelling over the sternum from chronic periostitis or abscess; a tumor or suppuration in other parts of the chest-walls; pericardial effusion; innominate aneurism; cardiac disease. Among very rare conditions may be mentioned coarctation of the aorta; varicose aneurism; and aneurism of the pulmonary artery.

The points to be taken into account are as follows: 1. The age and sex of the patient; previous history, especially with regard to occupation, family history, and that of the origin and progress of the complaint. 2. The presence or absence and exact characters of pressure-signs. 3. The other symptoms observed, particularly noting whether there is general dropsy or albuminuria. 4. The exact situation of any prominence. 5. Should there be any pulsation, attention must be paid to its precise site, extent, rhythm, and characters, especially as to whether it is heaving and expansile, double, or attended with thrill; and if it is distinct from the cardiac pulsation. 6. With regard to dullness, it is necessary to notice its site and extent, especially whether it is in the course of the aorta or crosses the middle line; and if it corresponds most to any pulsation which may be evident. 7. The presence and characters of murmurs are very important, but these must not be mistaken for conducted cardiac murmurs. 8. Examination of the pulse may afford much aid, especially by the sphygmograph; and also the effects of pressure upon the great vessels in the neck.

The distinctions between aneurism and a solid tumor will be hereafter considered. The chief difficulties arising in the diagnosis of aneurism from cardiac diseases are, that aneurism may be simulated by enlargement of this organ accompanying valvular disease, especially if the aorta is atheromatous; or that an aneurism with very thin walls and fluid contents, pushing the heart down and to the left, may be mistaken for mere cardiac enlargement. The principal circumstances in favor of cardiac disease are, there being but one centre of impulse; the physical signs being in the region of the heart, or most marked here; the absence of pressure-symptoms; and the presence of general dropsy or albuminuria.

As regards the form of an aneurism, the signs in favor of general fusiform dilatation are given by Walshe as more diffuse pulsation, both above and below the clavicle; well-marked thrill; rough, prolonged, rasping, whizzing, or whirring murmur, which is systolic, audible along the arch, or louder there than over the aortic orifice; and absence or slight degree of pressure-signs.

The part of the vessel affected must be determined by the locality of the physical signs, and the exact pressure-signs observed; comparison of the radial pulses, especially as revealed by the sphygmograph, may afford some aid.

In distinguishing innominate aneurism from aortic, the following

considerations have weight: The physical signs correspond to the region of the innominate artery; the prominence appears early, and it may displace the clavicle; it is said that dysphagia and dyspnoea from the pressure of an innominate aneurism are rare, but I have known both these symptoms extremely severe; there are often signs of pressure on the nerves of the right brachial plexus, and on the right bronchus; the right radial pulse is always modified; and pressure on the carotid and subclavian arteries on the same side diminishes the pulsation.

TREATMENT.—The first object in the treatment of an aneurism should be to endeavor to bring about its cure by promoting coagulation, but this can only be aimed at in the case of a sacculated aneurism. Failing this, it is necessary to protect it; retard its development as much as possible; and treat the symptoms and complications which so frequently arise.

If it is intended in any case to attempt to cure a thoracic aneurism, it is absolutely essential to keep the patient at rest in the recumbent posture for a considerable time, and to avoid every source of mental disturbance. Formerly it was the custom to have recourse to starvation and repeated venesection; but at the present day this has been with good reason modified into a careful regulation of diet, a definite quantity of solids and liquids being administered at stated intervals, according to Mr. Tufnell's method. The exact amounts must depend upon each individual case, but everything should be strictly weighed or measured, the object being to support life with as little food and drink as possible, without inducing nervous irritability. Excess of fluid must be particularly avoided, and all stimulants are to be prohibited. In some instances it may be advisable to remove a little blood from time to time, but it is very important to avoid inducing an anæmic condition.

The objects of this attention to rest and diet are to calm the circulation as much as possible, and to render the condition of the blood more favorable for coagulation; and undoubtedly some cases do improve considerably under this treatment alone. Medicinal agents, however, may be employed with benefit at the same time, viz., those which subdue and regulate the heart's action, such as digitalis, aconite, or belladonna; and those which promote coagulation, particularly gallic or tannic acid, tincture of steel, acetate of lead, and iodide of potassium. The last has been very well spoken of by Dr. Roberts of Manchester and Dr. Balfour of Edinburgh, when given in large doses, even as much as from 15 to 30 grains thrice daily, and continued for a long period. Some employ watery purgatives, in order to remove the watery portion of the blood, but this treatment is of more than questionable efficacy.

It is necessary to mention certain operative procedures to which recourse has been had with the view of curing aortic aneurism. These are: 1. Injection of perchloride of iron into the sac. 2. Manipulation

of the sac externally. 3. Galvano-puncture. 4. Introduction of a quantity of fine iron wire through a canula. 5. Ligature of the right carotid and subclavian arteries.

It would occupy too much space even to mention the various symptoms and complications which may require attention in the progress of a case of aneurism, and only a few practical points can be alluded to here. It is always well to keep the aneurism covered with cotton-wool, and should it be particularly prominent, some kind of protecting shield might be worn. For relieving pain and procuring sleep, the chief internal remedies are opium, hyoscyamus, lactucarium, hydrate of chloral, and conium in full doses. Subcutaneous injection of morphia is most valuable. External applications are also useful, such as belladonna or opium plaster; belladonna or aconite liniment; cold poultices of linseed meal and vinegar, conium, digitalis, or oak bark (Walshe); ice, ether spray, or chloroform cautiously applied; counter-irritation by flying blisters or iodine, which sometimes gives marked relief. Galvano-puncture sometimes relieves pain considerably, as in a case thus treated by Dr. Bastian. If there are severe laryngeal symptoms, evidently due to pressure on the recurrent nerve, it is decidedly justifiable to perform tracheotomy, and let the patient wear a tube. It has been suggested that in some cases the sterno-clavicular ligaments might be divided, in order to allow displacement of the clavicle forwards, and thus take off pressure from behind.

CHAPTER XXVI.

MEDIASTINAL TUMORS.

AORTIC aneurism is the most frequent form of mediastinal enlargement, and therefore it has appeared to me best to introduce what has further to be said on the subject in this place. The other chief varieties met with include cancer (either encephaloid or scirrho-encephaloid), originating in the œsophagus, lymphatic glands, root of the lung, or thymus gland; fibro-cellular, fibrous, or fibro-fatty tumors; enlarged masses of glands in tuberculosis or Hodgkin's disease; inflammatory exudation and abscess; very rarely masses of steatoma or hair.

SYMPTOMS AND SIGNS.—The symptoms are mainly those indicative of pressure, and they accordingly present the usual variations. "Currant-jelly" expectoration is said to be common in cancer. There may be constitutional symptoms of this diathesis. The *physical* signs of a solid tumor are also widely different, but the following list will suggest those which are to be sought for: 1. Local bulging, especially in front, of variable extent, often irregular, not pulsating. 2. Deficiency or

absence of respiratory movements over the seat of the growth, or in some instances over the whole of one side, from pressure on a bronchus. 3. Altered percussion-sound, often over a considerable area, it being either dull and toneless; hard, wooden, and high-pitched; or occasionally tubular or amphoric; there being also marked resistance. 4. Respiratory-sounds weak or absent, blowing, or tubular, according to the relation of the enlargement to the main air-tubes. 5. Vocal fremitus usually absent; and vocal resonance either deficient, bronchophonic, or pectoriloquous. 6. Dry and moist râles in the bronchi, which are not infrequent. 7. Displacement of the heart and other structures; increased conduction of the heart-sounds; and occasionally a murmur, from pressure on a great vessel.

DIAGNOSIS.—Mediastinal tumor has in the first place to be distinguished from other morbid conditions within the chest, especially chronic pneumonia, chronic pleuritic effusion, pericardial effusion, and enlargement of the heart. Careful consideration of the history of the case, as well as of its symptoms, physical signs, and progress, will rarely leave much doubt as to the diagnosis thus far. It is much more difficult, however, to determine the nature of any mediastinal enlargement. In the diagnosis between aneurism and a solid tumor, when this is at all doubtful, the following considerations have weight, these having been chiefly compiled from the observations of Dr. Walshe: 1. The facts of the patient being a female and under 25 years of age point to a solid tumor; the family history may be suggestive of cancer; or the occupation may be in favor of aneurism. 2. As regards symptoms, dysphagia and severe pain, especially posteriorly, are more common in aneurism; œdema of the arm and chest, frequent hæmoptysis, and currant-jelly expectoration, are more characteristic of tumor. Occasionally cancer elements may be discharged in the sputa. 3. The physical signs are of much value. The limitation of these to the region of the aorta; the presence of any thrill; a double impulse, especially with doubling of the diastolic share; and gradual approach of any pulsation to the surface, are suggestive of aneurism; great superficial extent of dulness; absence of any heaving character in the pulsation, should this sign be present; and the want of accordance between it and the maximum dulness, are in favor of a solid tumor. 4. Careful examination may reveal cancer in other parts; or there may be constitutional indications of its presence.

With regard to the distinction between different solid enlargements, all that can be stated is that cancer is the most common; there may be signs of the cancerous cachexia or of cancer in other parts; while abundant hæmoptysis is by far most frequent in this form of tumor, or cancer-cells may be expectorated. It also grows outwards, and has a rapid progress.

TREATMENT.—All that can be done is to relieve symptoms as they arise.

CHAPTER XXVII.

ON CERTAIN ABNORMAL CONDITIONS OF THE BLOOD.

THE blood is liable to numerous deviations from a healthy state, but of these alterations, though they are interesting and important, the limits of this work will only permit a general outline, except in some particular instances. The changes observed may be arranged as follows:

I. *In the absolute quantity of the blood.* This may be: 1. Excessive (plethora). 2. Deficient (hyperæmia or anæmia). II. *In obvious physical characters.* The blood may be unusually pale and watery; dark from pigment; thick and tarry; or the serum has sometimes a milky appearance, due to the presence of fat. III. *In the number and characters of the corpuscles.* 1. The red corpuscles may be: (a) deficient (oligocythæmia); (b) in excess (polycythæmia); or (c) altered in shape and size, or in their tendency to and mode of mutual adhesion. 2. The white corpuscles are often too numerous, but this is particularly seen in the condition named *leucocythæmia*, which will be considered under splenic diseases. IV. *In the normal chemical constituents.* 1. Fibrin may be: (a) increased (hyperinosis); (b) diminished (hypinosis); or (c) altered in its tendency to coagulate. 2. Albumen is frequently deficient; sometimes above the normal. 3. Water may be excessive (hydræmia) or deficient. 4. A diminution in alkaline or earthy salts, especially those of potash and lime, is considered important in some diseases; occasionally they are increased. 5. Fatty elements, particularly cholesterin, may be present in unusual quantity. V. *Abnormal chemical substances* are often found in the blood, or, at all events, such as are usually present in so small a quantity as to be detected only with difficulty and to be practically harmless, *e. g.*, lactic, uric, formic, and other organic acids; leucin and tyrosin, urea and its products, bile elements, and certain metals. VI. *Abnormal microscopic particles* are also not uncommonly observed, such as abundant pigment-granules (melanæmia), pus-corpuscles, animal or vegetable parasites.

In numerous instances more than one form of deviation is observed.

ANÆMIA—SPANÆMIA—CHLOROSIS.

The term *anæmia* is used very vaguely, and, in addition to its strictly literal sense, it is applied in practice to three classes of cases, *viz.*, where the blood is deficient in quantity, where it presents certain abnormal qualities, and where the arteries are inadequately filled. These conditions, however, are usually more or less combined. The chief

alterations in quality are deficiency of red corpuscles, as well as often of albumen, with excess of water and salts, the serum having a low specific gravity. Fibrin is proportionately high, and the blood has a tendency to coagulate in the veins. *Chlorosis* or *green sickness* merely signifies that there is a peculiar greenish tint, such as is frequently observed in anæmic girls, associated with menstrual derangements, the color being supposed to depend upon some chemical change in the blood pigments.

ETIOLOGY.—Very many causes may give rise to anæmia, but the chief include considerable loss of blood at one time, or repeated small losses; unfavorable hygienic conditions, especially constant sedentary or laborious employment in a confined atmosphere, with deficiency of sunlight; improper or insufficient food, particularly a want of animal diet; impaired power of digestion; excessive drain upon the system, such as over-lactation, diarrhoea, or chronic suppuration; prolonged exposure to malarial influence, with or without attacks of ague; various chronic diseases which interfere with nutrition, *e. g.*, phthisis, cancer, renal or splenic disease, gastric ulcer, acute febrile diseases, excessive venery or masturbation, depressing mental influences, chronic poisoning by lead, mercury, and other metals. In many instances several of these causes have combined in inducing anæmia. A pale anæmic aspect may be a striking feature in persons suffering from mitral or aortic disease, but this is partly due to insufficient filling of the arteries.

Females, especially from 15 to 25 years of age, are most frequently the subjects of anæmia or chlorosis. This has been supposed to be mainly the result of the great demands made on the developmental powers about the period of puberty, but commonly it will be found in the history of these cases that there are some other obvious causes, which at all events have aided materially in giving rise to the anæmic condition, the most important being long-continued habitual constipation, which necessarily leads to derangement of the digestive organs and consequent imperfect nutrition, and abstinence from animal food, this being the consequence of the loss of appetite, or rather disgust for food, which is necessarily associated with the unhealthy state of the alimentary canal. Other influences are also frequently at work in these cases, such as deficient exercise, close confinement, over-work, particularly with some sewing machines, and mental depression.

SYMPTOMS.—The aspect of persons suffering from anæmia is, as a rule, sufficiently characteristic. They are pale, often waxy-looking and have a clear transparent skin; or, as already mentioned, a greenish or yellowish-green hue is observed in chlorotic girls. The veins are frequently, however, very evident, and may have a peculiar pinkish tint. The mucous membranes present the most marked signs of anæmia, especially the conjunctiva of the lower eyelid, and the membrane covering the lips, gums, and tongue, these being more or less pale and blood-

less. The sclerotics appear clear and bluish. The general condition will vary according to the cause of the anæmia; in chlorosis the patient is often apparently well nourished, though the tissues are usually flabby and wanting in tone. Edema about the ankles and puffiness of the eyelids in the morning are common symptoms, and there may even be considerable anasarca of the legs after standing for some time. The effect of anæmia in promoting dropsy from other causes has been previously alluded to.

The subjective sensations complained of are also very uniform in chlorotic girls. These are debility, languor, and incapacity for exertion; general chilliness and coldness of the extremities; shortness of breath and palpitation after any effort, or even without this; sometimes a tendency to syncope; headache, dizziness, and noises in the ears; neuralgic and hysterical pains in different parts of the body, but especially in the left side, this being frequently accompanied with tenderness, and being liable to come and go. It has appeared to me that this pain in the left side may possibly be connected with the spleen in some cases. Anæmic females are often low-spirited or irritable, and subject to hysterical attacks.

The digestive organs are usually at fault. Appetite is impaired or depraved, and there may be an absolute disgust for food, especially meat. Gastralgia and atonic dyspepsia are common. The bowels are obstinately constipated as a rule. Hæmatemesis and melæna occasionally occur. Menstruation is almost always deranged, being absent, infrequent, irregular, scanty, unhealthy, painful, or sometimes menorrhagic. Leucorrhœa is also frequently present.

Certain abnormal *physical signs* are observed in marked anæmia, which have been already described, and therefore need only be enumerated here, viz., a systolic murmur at the base of the heart, usually pulmonary; a blowing murmur in the arteries, especially the subclavian, and sometimes a thrill; and venous hum, which is in some cases even heard over the cranium, and may also be accompanied with a thrill. The heart's action is very liable to be disturbed, becoming easily excited and hurried, and in severe cases even irregular. The pulse is small, feeble, and compressible; or sometimes scarcely perceptible.

The urine frequently presents important changes, being pale and watery, excessive in quantity, of low specific gravity, deficient in acidity, with a marked decrease in the amount of pigment.

It is believed that anæmia may ultimately lead to organic diseases, such as phthisis or gastric ulcer. Acute affections occurring in anæmic individuals are apt to assume a low type, and to be followed by protracted convalescence.

TREATMENT.—The first thing to be done in all cases of anæmia is to find out its causes and remove these if possible. Attention to hygienic conditions is most essential, especially in the case of chlorotic girls.

Fresh air, good light, outdoor exercise, avoidance of late hours and of hot and crowded rooms, change of air and scene to some dry and bracing climate, especially to the seaside, cheerful society, and the removal of all disturbing mental influences are most efficient aids in treatment. Baths, particularly sea-bathing, or douches followed by friction are very beneficial, if followed by good reaction. It is also most important to look to the diet, and to the state of the digestive organs. Nutritious food must be given at stated intervals, and it is often requisite to lay down strict rules on this matter, particularly with regard to meat, to which many of these patients have a strong objection. It ought to be taken underdone, and if it causes pain it may be pounded. Nutritious soups are also useful, and beer or wine is generally indicated. The state of the bowels demands particular notice, and the patient should be fully impressed with the necessity of having a sufficient daily evacuation. Aloes is one of the best forms of aperient in these cases, given at night in the form of *pil. aloes c̄ myrrh*; or as extract. Remedies which act upon the stomach are frequently very beneficial also, bismuth with hydrocyanic acid being particularly valuable in relieving the unpleasant and painful sensations connected with this organ, when taken shortly before meals.

Iron in some form is the great remedy in anæmia. The *mist. ferri. co.* is eminently efficacious in chlorosis, and among other excellent preparations may be mentioned *pil. ferri. co.*; the saccharated carbonate; the ammonio-citrate; and the *ferrum redactum*. Tincture of steel is invaluable in many cases, especially when the anæmia is associated with excessive discharges. The solution of the permittate, the sulphate, and magnetic oxide are also very useful preparations; while in anæmic children steel wine and the tartrate produce excellent results. Chalybeate waters are beneficial in some instances. Iron may be combined with infusion of quassia or calumba, or with quinine or strychnine, and some practitioners recommend it to be given along with arsenic, manganese, pepsin, and other remedies. The citrate of quinine and iron and Easton's syrup are very valuable preparations. It is frequently desirable to change the form of the preparation from time to time; or even to stop the administration of iron temporarily, should it appear to disagree.

The pain in the side often requires attention in chlorosis, and is usually much relieved by wearing a belladonna plaster.

PYÆMIA—SEPTICÆMIA.

This is a subject belonging principally to surgery, and in this work it is merely intended to indicate the chief practical facts with regard to the affection as it is occasionally presented in medical practice.

ETIOLOGY.—Excluding obvious injuries and operations, the causes of pyæmia or septicæmia may be arranged as follows: 1. Disease of bones,

either acute or chronic, leading to suppuration; it may thus arise from disease of the temporal bone. 2. Affections of the heart or vessels originating septic materials which contaminate the blood, *e. g.*, endocarditis; softening of clots, especially in the veins; phlebitis. 3. Formation of abscesses or gangrene in any part, either external to or within organs. 4. Ulceration of mucous surfaces, *e. g.*, the gall-bladder or its duct, or the intestines. 5. Inflammation of a low type and attended with suppuration, implicating the pelvis of the kidney, bladder, or urinary passages. 6. Diseases characterized by external inflammation of an unhealthy character, leading to the formation of pus, especially the different varieties of erysipelas, variola, vaccinia in revaccination, malignant pustule, glanders, carbuncles or boils; under this class may also be mentioned dissection and post-mortem wounds. 7. Low fevers occasionally, such as typhus, there being no evident local source of blood-poisoning. 8. Idiopathic pyæmia has been described, but it must be borne in mind that pyæmia may follow a very slight injury in unhealthy subjects, and that there are many internal causes which might escape detection.

ANATOMICAL CHARACTERS.—It is highly probable that death may result from pyæmia without any characteristic post-mortem appearances being left. The morbid changes which it tends to originate may be summed up thus: 1. Intense congestion throughout the various organs and tissues of the body. 2. Hæmorrhages, in the form of petechiæ or vibices in connection with the skin, mucous and serous membranes; hæmorrhage into serous cavities; extravasations into muscles and among deep tissues; and apoplectic clots in the substance of organs, which are prone to undergo rapid destructive changes. 3. Acute inflammation in the solid organs, of a low type. 4. Formation of abscesses in these organs, often in considerable numbers, of good size, and containing unhealthy pus; resulting either from hæmorrhagic clots, inflammation, or sloughing. 5. Gangrene of portions of organs. 6. Low serous inflammations, with a tendency to purulent effusion, which may be confined within abscesses, and to the production of unhealthy lymph. 7. Inflammation of mucous surfaces, leading to suppuration, ulceration, or sometimes to submucous abscesses or gangrene. 8. Severe inflammation of joints, with a great tendency to rapid formation of pus and destruction and disorganization of tissues, both within and around the joints, several of them being usually involved. 9. Inflammation and formation of abscesses in various parts of the body, viz., in the substance of muscles; in the cellular tissue, either superficial or deep; and sometimes in the skin itself, giving rise to pustules.

SYMPTOMS.—In many instances pyæmia reveals itself very insidiously, but its characteristic symptoms in an acute case are mainly these: Rigors set in suddenly, severe and prolonged in character, and repeated at irregular intervals. The temperature often rises rapidly to a high

point, being usually very elevated throughout, but subject to marked and extremely irregular changes. Profuse sweating follows the rigors, in the intervals the skin being hot, dry, and harsh. There is a marked expression of illness, and a tendency to early prostration, combined with restlessness or heaviness. The skin soon appears sallow and yellowish, and frequently considerable jaundice becomes evident; congestion and petechiæ may often be seen, and sometimes sudamina or a vesicular or pustular eruption. The digestive organs are usually much disturbed from the outset, there being anorexia, great thirst, nausea and vomiting, frequently with a glazed or furred and irritable tongue, and in some cases fetid diarrhœa. The pulse is frequent, feeble, and liable to rapid variations. Respiration is also hurried, and the breath has a peculiar sweetish odor in some cases. Albuminuria is not uncommon.

In a short time the symptoms and signs of the local lesions may appear in various parts, these necessarily differing according to the structures which are affected; the joints are involved with considerable frequency, becoming very painful and swollen. The further tendency is towards rapid and extreme prostration and adynamia, with low nervous symptoms; the face becoming pale and pinched; the heart's action exceedingly rapid, weak, irregular, and intermittent, as evidenced by the impulse, sounds, and pulse; the tongue brown and dry, with sordes on the teeth and gums; delirium, coma, or, rarely, convulsions setting in at last, with involuntary discharge of fæces and urine.

In some instances pyæmia is evidenced chiefly by its general symptoms; in others it runs a somewhat chronic course, and may then terminate in recovery. Some authorities regard certain diseases, which will hereafter be considered, as originating in a local pyæmia.

DIAGNOSIS.—It is important to distinguish pyæmia from various fevers and acute inflammatory affections which it may simulate; and to bear in mind its possible occurrence in connection with the morbid conditions mentioned under its etiology. In some cases its course of temperature causes the complaint to resemble ague.

TREATMENT.—The only chance of recovery lies in the free and regular administration of nutritious food, stimulants, and tonics, especially mineral acids, bark, quinine, and tincture of steel. Antiseptics have been strongly recommended. Local lesions must be attended to as they arise.

CHAPTER XXVIII.

THROMBOSIS AND EMBOLISM.

By *thrombosis* is meant a local coagulation of blood during life, either within the heart or a vessel, a clot being thus formed, named a *thrombus*.

Embolism signifies the partial or entire plugging of a bloodvessel by a solid fragment or *embolus* conveyed from some distant part.

I. THROMBOSIS.

ETIOLOGY.—The causes which tend to the formation of a thrombus may be thus stated: 1. Anything which impedes or retards the blood-current, *e. g.*, valvular and other organic diseases of the heart, pressure upon its cavities, or mere feeble cardiac action, such as is observed after fevers or in various chronic wasting affections; affections of the lungs impeding the pulmonary circulation; obstruction of a vessel by constriction, pressure, or internal plugging, especially by an embolus; pressure upon the capillaries of a part; solution of continuity of a vessel; and dilatation of vessels, particularly aneurisms, varicose veins, and distended venous plexuses. A generally feeble state of the circulation and gravitation may also contribute to the formation of a thrombus. 2. Conditions which give rise to an abnormal condition of the inner surface of the heart, or of the coats of the vessels, *e. g.*, acute inflammation; fissuring of the surface; atheroma or calcification; projection of cancerous and other new formations into the interior of vessels; and the changes in their walls associated with surrounding gangrene or inflammation. 3. Certain conditions of the blood, *viz.*, hyperinosis or increased tendency in the fibrin to coagulate, such as may be observed in various acute inflammatory affections and pregnancy; probably pyæmia and allied states; and anæmia. Increased heat of the blood, either local or general, has been looked upon by Richardson and others as a probable cause of thrombosis. In many instances more than one of the above-mentioned conditions has contributed to the clotting process.

In further considering this subject it will be convenient to treat separately thrombosis of the heart, pulmonary, and systemic vessels.

CARDIAC THROMBOSIS—INTRACARDIAC BLOOD-CONCRETIONS.—Coagula may form in the heart after death; immediately before this event; or at some previous period more or less remote. These are distin-

guished from each other by their color; consistence; mode of arrangement with regard to and degree of adhesion with the cardiac walls; whether they are laminated or not; and whether they have undergone changes, either in the direction of organization or softening. It is desirable to make a few special remarks respecting the coagulation occurring shortly before death, as this is probably often a very dangerous event, and one which aids materially in bringing about a fatal result. It is observed in connection with organic diseases of the heart which obstruct the circulation or roughen the endocardial surface, but is most important in certain acute diseases, being then due to a condition of the blood favorable to coagulation, combined with a gradual loss of power in the cardiac contractions, in consequence of which the blood is not properly expelled out of the heart, but is partially whipped up and its fibrin deposited. Obstruction in the lungs frequently contributes to the clotting process. Among the most important diseases in which this is observed are croup, diphtheria, endocarditis, pneumonia, peritonitis, the puerperal condition, erysipelas, rheumatic fever, and pyæmia and its allies. Cardiac thrombosis is much more common as well as more dangerous in the right cavities than the left, but may occur on both sides. Usually the clots are decolorized, pale or yellowish, but not uniform throughout; firm and fibrinous; often laminated and fibrillated or granular; entangled among the muscular bands and tendinous cords; somewhat adherent to the surface, but separable without injuring the endocardium. Occasionally they soften in the centre. They may extend a variable distance into the pulmonary artery or aorta, these portions frequently presenting marks of the valves, but they can be readily removed.

SYMPTOMS AND SIGNS.—The effects of cardiac thrombosis will vary with the rapidity of its production, its seat, and extent. The dangers are that it causes obstruction to the circulation and interference with the heart's action; that large portions may become detached, and lodged either in one of the main orifices or in an arterial trunk; or that smaller particles should be separated, and conveyed into the smaller vessels as emboli. Probably also the products of the softening of a clot may poison the blood generally. Sudden extensive clotting is characterized by great disturbance of the cardiac action, which becomes irregular and very hurried, the pulse being extremely weak and small; a tendency to syncope; urgent dyspnœa; intense restlessness and anxiety; followed by signs of obstruction, either in the pulmonary or venous circulation or both, according to the situation of the clot. In less rapid cases the obstructive symptoms are chiefly observed, with more or less cardiac distress. Plugging of an orifice or great vessel by a clot may cause instantaneous death. The *physical signs* are tumultuous action of the heart, or great irregularity in the rhythm and force of the impulse; increased cardiac dulness, especially towards the right;

obscurity and irregularity of the sounds, particularly the first; and alteration in murmurs, or the production of a new murmur, especially pulmonary systolic.

TREATMENT.—The measures required in this condition are absolute rest in the recumbent posture; stimulants, especially if there is a syn-copal tendency, with as much liquid nourishment as the patient can take comfortably; heat to the extremities; and free dry cupping over the chest. Formerly alkaline bicarbonates were recommended to be freely administered with carbonate of ammonia. Dr. Richardson has advocated the use of liquor ammoniæ (℥x in iced water every hour), with iodide of potassium (gr. iii to gr. v every alternate hour), which he has found highly successful. In some instances digitalis might, perhaps, be of use in order to excite stronger contraction of the heart; or gentle galvanism might be tried. All lowering measures are injurious, and opiates must be avoided.

THROMBOSIS IN THE PULMONARY ARTERY AND ITS BRANCHES.—Much discussion has been carried on relative to pulmonary thrombosis, especially as it occurs in women after parturition. Occasionally such persons die suddenly, and after death extensive clots are found in the pulmonary artery and its divisions, which some believe to have been the cause of death, and to have formed there primarily and independently; others think that they are the result of embolism, fragments having become detached from clots in the veins or heart, and lodged in the pulmonary vessels as centres for coagulation; while still others regard death as being due to syncope, and the clot to be merely of post-mortem formation. The probability is that in most instances at all events embolism has something to do with the phenomena observed; and it is quite possible that a large mass may be sometimes carried into the pulmonary artery so as to obstruct this vessel.

Clots may be found only in the main trunk and larger divisions; in the smaller branches; or more or less throughout. According to the extent involved and to the rapidity of coagulation will the clinical phenomena vary. In some instances, as already stated, sudden death is believed to occur, preceded by a cry, resulting from some effort after parturition. When only the smaller branches are affected there are no symptoms. If the clotting is more extensive, the symptoms are more or less dyspnœa and sense of want of air, with oppression across the chest; evidences of cardiac embarrassment; faintness or actual syncope; much general distress and anxiety; followed by signs of overloading of the right heart and general venous congestion. The symptoms may temporarily subside and then recur. It is highly probable that coagulation in the pulmonary vessels often adds to the danger of various lung and general diseases, and prolongs the duration of the former.

TREATMENT must be similar to that for cardiac thrombosis.

THROMBOSIS IN THE SYSTEMIC VEINS—PHLEGMASIA DOLENS.—The formation of clots in the systemic veins is by no means an uncommon occurrence, resulting from pressure, obstruction, feeble circulation, altered blood, and other causes, but it is most important in connection with the affection named *phlegmasia dolens*, in which as a rule the lower extremity is involved, the external iliac or femoral vein becoming obstructed on one or both sides, or sometimes the common iliac; occasionally the arm is affected. The formation of clots in the venous sinuses of the dura mater is also a very serious matter, which I have observed as the result of injury or disease of the cranial bones.

Phlegmasia dolens is most frequently associated with the puerperal state, coming on at a variable period after delivery, but it may also occur as a sequela of acute febrile diseases, especially typhus and typhoid fever, pleurisy, and pneumonia; and in the advanced stages of various chronic diseases, particularly phthisis and malignant uterine disease. Different views are held as to the pathology of this affection. Some regard inflammation of the veins—*phlebitis*—as the primary lesion after parturition, this having extended to the uterine veins; others consider that the plugging is the first event, resulting from impure blood or embolism, the emboli frequently coming from thrombi in the pulmonary vessels, and that the inflammation is secondary. Certainly in the cases which have fallen under my observation, where *phlegmasia* has arisen independently of parturition, coagulation has appeared to be the primary morbid condition, and it has sometimes been brought about by an effort, especially when this was accompanied with temporary obstruction of the venous circulation in some part.

ANATOMICAL CHARACTERS.—A thrombus in a vein varies in its characters according to its age and mode of formation. If a vessel is suddenly plugged, the clot is at first uniform throughout, soft and red; but if this is gradually formed it presents a stratified appearance, and the strata may consist of alternate layers of fibrin and white corpuscles. The thrombus increases in extent after its first formation, the degree of extension depending chiefly on the force of the circulation, and on the size and situation of the collateral branches. The thrombus undergoes the usual changes in color and consistence; becomes adherent to the vessel, in which it frequently excites inflammation; and organization often follows, so that ultimately a fibrous cord alone remains, the vein being obliterated—*adhesive phlebitis*. Occasionally calcification takes place, a “*phlebolith*” being produced. In some instances the clot undergoes partial or complete softening or liquefaction, beginning in the centre, and a puriform fluid may result, consisting either of granules and molecules derived from the fibrin, with broken-down corpuscles; or as some believe, of actual pus derived from proliferation of white corpuscles. This is probably the pathology of so-called *suppurative phlebitis*.

In this way the clot may be completely removed; or substances are originated which contaminate and poison the blood.

In *phlegmasia dolens* the smaller veins and lymphatics also become speedily involved, and more or less inflammation is in many cases set up in the skin and subcutaneous tissue, or even in the deeper structures.

SYMPTOMS AND EFFECTS.—The symptoms which may be associated with venous thrombosis are those due to: 1. Local irritation by the clot. 2. Obstruction of the vein and consequent interference with the circulation. 3. Detachment of embolic fragments. 4. Constitutional disturbance, which may result from the formation of septic matters and contamination of the blood. In *phlegmasia* pain and tenderness along the veins and lymphatics of the thigh are usually complained of to a variable degree. One case which came under my notice, in which the disease followed typhus fever, commenced with a sudden intense pain at the moment of coagulation, which afterwards became most excruciating, deeply situated in the course of the femoral vein, and of an aching and somewhat neuralgic character. In phthisis, also, *phlegmasia* is often the cause of much distress. The veins are in time felt to be thickened and firm or cord-like, and the lymphatics are visible as red lines. Soon there may be signs of venous congestion, but very speedily this is followed by a deadly whiteness of the limb (*white leg*), which swells from below upwards, chiefly on account of œdema, sometimes attaining an enormous size, and becoming tense or elastic, with a most uncomfortable subjective feeling of tightness. In time the superficial veins become enlarged and varicose if the obstruction is not removed, and the leg often remains swollen for many months or even permanently, the tissues being thickened and indurated. Rigors may be experienced at the outset, followed by pyrexia and much prostration.

TREATMENT.—In *phlegmasia dolens* the most efficient treatment is to support the patient by nourishing food and stimulants; to keep the leg perfectly at rest in a horizontal posture or even a little raised; to use hot opiate or belladonna fomentations assiduously; and to give sedatives for the purpose of relieving pain, if required. Subsequently tonics, especially iron and quinine; good diet; and change of air are most beneficial; with douching, frictions, and shampooing of the limb, which must either be carefully bandaged, or an elastic stocking be worn. Great improvement may be effected even after a long interval.

THROMBOSIS IN THE ARTERIES.—This is almost always associated either with a diseased condition of the walls of a vessel; or with embolism. Its symptoms are merely those indicative of local obstruction of arteries.

II. EMBOLISM.

ORIGIN OF AND ANATOMICAL CHANGES RESULTING FROM EMBOLI.—The following are the principal sources of emboli: 1. Most commonly

a thrombus in a systemic vein; in the heart; in an artery, especially in connection with aneurism; or rarely in the pulmonary vessels. 2. Vegetations about the valves and orifices of the heart, particularly if associated with obstructive disease, especially mitral stenosis. 3. Atheroma and calcification of the cardiac valves or of arteries, portions of the morbid materials becoming detached. 4. New growths, *e. g.*, cancer, communicating with the interior of vessels. 5. Particles resulting from gangrene of organs. 6. Parasites which have gained access into the vessels. 7. Pigment-granules. 8. Fat particles from bone-marrow.

According to the size and place of origin of the embolus will the seat of its arrest vary. It may be sufficiently large to plug an artery of considerable size, or is only stopped in the capillaries. When originating in the venous portion of the circulation emboli rarely pass through the pulmonary capillaries, but become impacted there as a rule; those coming from the pulmonary vessels, the left side of the heart, or the arteries, lodge either in smaller arteries or in the capillaries, and especially in the vessels of the brain, spleen, and kidneys; those from the portal tributaries are generally arrested in the capillaries of the liver. An embolus is chiefly carried in the direction of the main stream, and it is somewhat influenced by gravitation. The seat of impaction is often at a bifurcation, and the closure may be complete or only partial at first, but a secondary thrombus always forms, so that ultimately the vessel is entirely blocked up to a variable extent. Secondary emboli are sometimes separated from the primary one or the resulting thrombus, and pass on into smaller vessels. Embolism causes local irritation in the vessel in which it lodges, and is soon followed by marked hyperæmia in the collateral vessels around, extending over a variable area, which often terminates in their rupture, with the formation of a *hæmorrhagic infarct*. In time the latter either becomes decolorized, more consistent, and organized; or a process of softening and molecular disintegration takes place, beginning in the centre of the infarct, and extending more or less to the circumference, the débris of the involved tissue being evident in the softened mass. Ultimately it may be absorbed; or remain as a caseous encapsuled mass; or become calcified. The nature of the changes will depend upon the degree to which the circulation is obstructed, and the difficulty in establishing the collateral circulation; the tissue affected; the size of the infarct; and the character of the embolus. If this has septic properties, as when it comes from a gangrenous part, it sets up rapid and violent inflammation, ending in speedy disorganization with the production of a puriform material, constituting an *embolic abscess*, which is surrounded by hyperæmia.

The effects of an embolus as regards the part supplied by the vessel which is blocked up are similar to those of obstruction from any other cause, *viz.*, anæmia, atrophy, softening, fatty degeneration, or actual gangrene.

The most important seats of embolism are the vessels of the lungs, brain, spleen, kidneys, and heart. Petechial spots on the skin, mucous and serous membranes are sometimes due to this cause. A very interesting case came under my notice in which sudden embolism occurred in connection with the main vessels of the forearm.

SYMPTOMS.—The clinical phenomena of embolism necessarily vary greatly according to the vessels affected; the rapidity and degree of obstruction; the characters of the embolus; and other circumstances. It need only be stated here in a general way that the symptoms are those significant of sudden or gradual obstruction of the vessels supplying some organ or part; followed by those indicating the local effects of the embolus, and in some cases by evidences of septicæmia. Embolism affecting particular organs is considered in their respective chapters.

CHAPTER XXIX.

DISEASES OF THE ABDOMEN.

PHYSICAL EXAMINATION OF THE ABDOMEN.

BEFORE proceeding to the consideration of the diseases of the abdomen and its contained organs, it is necessary to point out the various methods of "physical examination" which may be employed in their investigation; and to indicate the information which each of them is capable of affording. In order to make this examination satisfactorily, the abdomen should be properly exposed, and the patient placed in an appropriate position. The best posture ordinarily is on the back, with the head and shoulders considerably raised and the knees and thighs bent, so that the abdominal muscles may be relaxed; however, it is requisite in many cases to make the patient assume other positions, such as lying on either side or on the face, or kneeling supported on the hands and knees. The patient should be desired to breathe deeply, or the attention may be occupied with conversation, so that a state of contraction and tension of the muscles may be avoided, which is very apt to be produced. The examination should be carried out carefully and thoroughly, and not uncommonly it has to be made on more than one occasion before a satisfactory conclusion can be arrived at.

The following outline indicates the different modes of examination which might be required in the investigation of any particular case, though it does not often happen that they are all called for in the same individual. Some of them are similar to those employed in the exploration of chest-affections, though their relative value is very different; others are peculiar to the examination of the abdomen.

I. INSPECTION.—By this method is ascertained: 1. The state of the superficial parts, viz., the integuments, superficial veins, umbilicus. 2. The general shape and size of the abdomen; as well as any local alterations in these respects. 3. The characters of the abdominal respiratory movements. 4. The presence of any visible pulsation. 5. Certain movements, such as those due to flatus; to fluid when the position of the patient is altered; or to the presence of a fetus.

II. APPLICATION OF THE HANDS, PALPATION, OR MANIPULATION.—If properly carried out, this becomes one of the most valuable methods of examination in the investigation of the diseases of the abdomen; but it requires considerable practice, and the hands have to be employed in different ways in different cases.

Palpation reveals: 1. The condition of the abdominal walls, as regards amount of fat, oedema, and the state of the muscles. 2. The shape and size of the abdomen more accurately than inspection. 3. The sensations conveyed as regards mobility of the abdomen as a whole, degree of resistance, consistence, fluctuation, regularity and smoothness or the reverse, over the surface generally and over its different parts. 4. The existence of any enlarged organ or tumor, with its position and characters. 5. The extent of the respiratory movements, and their influence upon any tumor which may be present. 6. The situation and characters of any pulsation. 7. The presence of friction-fremitus developed during the act of breathing. 8. Any movements set up within the abdomen, such as gurgling from gas in the intestines, or fetal movements.

III. MENSURATION OR MEASUREMENT.—Merely an ordinary single and double measuring tape of sufficient length are required for measurement, and this affords exact information as to the size of the abdomen, and the diaphragmatic respiratory movements. It is particularly valuable as showing the progress of many cases, with the effects of treatment. The measurements ordinarily required are: 1. Circular in different parts, but especially a little above and below the umbilicus. 2. Semicircular, so as to compare the two sides. 3. Local, viz., from the umbilicus to the ensiform cartilage; to the pubes; and to the anterior superior spine of the ilium on each side.

IV. PERCUSSION.—“Mediate percussion” is usually practiced in the case of the abdomen. A modification of this is employed in the production of what is termed *hydatid-fremitus* or *vibration*, which is elicited by applying three fingers of the left hand firmly over certain cystic tumors, and striking the middle finger suddenly with the point of the right middle finger. Another method consists in applying the fingers of one hand over one side of the abdomen, and tapping or flogging the opposite side with those of the other hand, which is the usual plan for producing fluctuation.

The objects of percussing the abdomen are: 1. To bring out certain

sounds. 2. To realize certain sensations by the fingers, especially the degree of resistance; hydatid-fremitus; and fluctuation. The sounds elicited may be grouped under the terms *dulness* and *tympanitic sound*, these necessarily varying somewhat in their exact characters. In the normal state they are both met with over different parts of the abdomen, according to the organ which corresponds to the point percussed, and by this mode of examination the exact position and limits of most of the organs can be marked out. The deviations, as regards sound, which may be observed, are: (i.) Excess in the intensity, clearness, or extent of the tympanitic sound. (ii.) Dulness either too extensive, or in unusual positions. The last is the deviation which requires most attention; and when any normal dulness is detected, it is necessary to make out carefully: *a.* Its site, exact limits, and shape. *b.* Whether it differs according as superficial or deep percussion is made. *c.* If it is influenced by posture, the act of breathing, pressure, or manipulation; and in some doubtful cases it may be requisite to observe the effects upon it of taking food or drink; of the act of vomiting; the use of an enema; or the removal of urine by a catheter. With respect to resistance, by noticing its degree an accumulation of fluid may be distinguished from a solid mass, and the actual density of the latter can to a great extent be realized; it is likewise useful in separating flatulent distension of the abdomen from that due to the presence of fluid.

Hydatid-fremitus is a peculiar vibrating or trembling sensation, produced in the manner already described, and formerly supposed to be characteristic of hydatid tumors, but it can be brought out in connection with any large cyst which has thin and tight walls, and contains a fluid of watery consistence.

Fluctuation indicates the presence of fluid within the cavity of the abdomen, and it is needful to observe the degree of facility of its production and its distinctness, the part of the abdomen over which it is felt, and whether it is influenced by change of posture; thus information is obtained as to the quantity of fluid, its freedom or limitation by cysts or adhesions, and its consistence. It must be borne in mind that a relaxed or very fat condition of the abdominal walls may give rise to a sensation simulating fluctuation.

V. AUSCULTATION.—This is not nearly so useful a mode of examination in connection with the abdomen as the chest, and it need scarcely be mentioned that the intervention of a stethoscope is always advisable when practicing it. It generally only gives negative information, except in cases of pregnancy, but sometimes by its aid certain positive signs are detected, viz.: 1. Friction-sound or grating, heard during the act of breathing, and due to exudation on the peritoneum, or to roughness of the surface of certain organs. 2. Murmurs in connection with aneurism, with regard to which it is requisite to notice their site, intensity, extent of conduction, synchronism, pitch, and other characters; as well as any effects produced upon them by pressure or change

of position. 3. A murmur over the aorta or one of the common iliac arteries, due to pressure, such as that of a tumor. 4. Unusual conduction of the heart-sounds over the abdomen. 5. Sounds due to the movement of flatus in the intestines; or to the falling of food or liquid into the stomach. 6. Fluctuation or splashing-sound, elicited by shaking the patient, and indicating the presence of both air and fluid. 7. Murmurs and sounds heard in connection with the pregnant uterus.

In the majority of cases the methods of examination thus far considered are sufficient for establishing a diagnosis; but there are others which might be called for in doubtful cases, and from which much aid may be derived. At present it must suffice to enumerate them, as illustrations of their usefulness will be given hereafter.

VI. EXAMINATION DIRECTED TO THE ALIMENTARY CANAL.—This includes: 1. The passage of a probang into the stomach, the end being felt through the abdominal walls, which helps in making out dilatation of this organ. 2. Examination of materials discharged from the stomach, and it has even been recommended to make use of the stomach-pump, and thus obtain some of the contents at different stages of digestion. 3. The use of purgatives and enemata, in order to clear out the bowels, which should never be neglected in doubtful cases, the effects being noted; or the injection of a quantity of water or gas per anum. 4. Examination of the anus and rectum, by inspection, the speculum being employed if required; by the finger or hand, or by the bougie. 5. Examination of the stools.

VII. EXAMINATION PER VAGINAM, as described in obstetric works.

VIII. EXAMINATION OF THE BLADDER AND URINE.—The use of the catheter must always be thought of when there is any reason to suspect an accumulation of urine in the bladder. It may also be requisite to sound this organ. In all cases it is absolutely necessary to examine the urine carefully.

IX. EXPLORATORY PUNCTURE WITH A SMALL TROCAR OR THE ASPIRATEUR.—This is done for the purpose of determining the presence and nature of fluid within the abdomen.

X. ADMINISTRATION OF CHLOROFORM.—This may be required in order to aid in carrying out other modes of examination; and it at once determines the nature of the so-called "phantom-tumor" of the abdomen.

Physical examination of the abdomen aids chiefly in investigating the following abnormal conditions: 1. General enlargements. 2. General retraction or depression. 3. Local enlargements or so-called "tumors." 4. Diminution in the size of organs; as well as certain changes in their physical characters, either with or without alteration in dimensions, *e. g.*, cirrhosis of the liver. 5. Pulsation unassociated with any change in shape or size. 6. Interference with the abdominal respiratory movements from various causes.

General and local abdominal enlargements are of very common occurrence, and therefore, although involving some repetition, it may perhaps be of service to indicate specially the course of investigation to be pursued, and the points to be observed in conducting a physical examination with the view of arriving at a diagnosis as to the cause of any such enlargement.

I. General Enlargements.—1. Examine as to the state of the abdominal walls, by inspection and palpation, paying particular attention to the characters of the umbilicus. 2. Ascertain the degree of enlargement and its exact form, by inspection, palpation, and measurement. 3. Note the extent of the abdominal respiratory movements by the same methods, and whether they give rise to any sensation of fremitus. 4. Manipulate thoroughly over every part of the abdomen, in order to determine the sensations conveyed as to smoothness and regularity, amount of resistance, consistence, gurgling, etc. 5. Observe specially if there is any feeling of fluctuation, as well as its seat, extent, and facility of production. 6. Percuss carefully, noting the sounds elicited over the abdomen in different parts, and the sensations conveyed to the fingers during the act. Sometimes it is requisite to examine for hydatid-fremitus. 7. Apply the stethoscope, chiefly to ascertain whether any friction-sounds are heard during the act of breathing; if there are any of the sounds usually observed in connection with a pregnant uterus; or a pressure murmur over either iliac artery. 8. Having examined thus far as the patient is lying in the ordinary position, it is then necessary to observe the effects of various changes of posture, especially as regards the shape of the abdomen; the percussion-sounds; and any fluctuation which may be present. 9. If after this a satisfactory diagnosis cannot be made, it will be requisite to have recourse to the other methods of examination mentioned, particularly examination by the rectum or vagina, and the employment of the aspirateur or exploratory trocar. Of course the urine should always be thoroughly tested.

II. Local Enlargements.—Manipulation is by far the most important mode of examination which can be employed in the investigation of localized abdominal tumors, and therefore it is specially necessary to educate the sense of touch for these cases. 1. Any local change in the skin; limited œdema; or enlargement of veins must be noted. 2. A cursory examination is desirable, in order to determine if there is but one tumor or more; and in the latter case whether they are separate or connected. The further remarks will apply to each enlargement, should there be more than one. 3. Ascertain the precise situation of the tumor, paying particular attention to the following points: *a.* Whether it extends into the pelvis. *b.* If it is median, or occupies one or other side, and to what extent. *c.* If it can be traced within the margin of the thorax; and if it enlarges its lower part or alters the

intercostal spaces in any way. *d.* Whether it corresponds to, or can be made out to be part of, either of the organs. *e.* Its depth, whether it lies in the abdominal walls; within the cavity near the surface; or deep down near the spine. 4. Mark out the dimensions and shape as nearly as possible, observing the form of the margin; if this is well or ill-defined; and if the outline corresponds to that of any abdominal organ. 5. Feel carefully over the surface and margins to determine whether they are smooth, granular, nodular, or lobular, noticing the characters of any prominences which may exist; and at the same time try to realize the consistence, which may be more or less hard and firm, elastic, doughy, fluctuating, etc. It is important to observe whether the sensations are uniform or not over the enlargement; and if any change is produced by pressure and manipulation, or any gurgling or grating is thus elicited. 6. Ascertain whether the tumor is movable or fixed, as well as the degree of mobility, both by manipulation and under the influence of the respiratory movements. 7. Should there be any pulsation or thrill, the exact seat and characters of each must be noted. 8. Percussion is, of course, most valuable in bringing out sounds and tactile sensations, and in many cases the precise limits and characters of an enlargement can only be made out in this way. It is important to notice whether the results of percussion are uniform over the entire surface or not. 9. Auscultation is sometimes useful, especially in order to investigate murmurs, which may be associated with the tumor itself, or be the consequence of its pressure upon an artery. 10. The posture must be altered, as in the case of general enlargements, and the effects observed, as regards the site of the tumor; its percussion-sound; or any changes affecting fluctuation, pulsation, or murmur, should either of these be present. 11. Without again recapitulating the more unusual methods of examination, it may be stated that either or all of them may be called for in doubtful cases, and under any circumstances it is most desirable that the bowels should be thoroughly emptied by the use of purgatives and enemata, as collections of *fæces* may cause much obscurity, and not uncommonly simulate tumors of a very serious nature.

CHAPTER XXX.

DISEASES OF THE PERITONEUM.

I. ACUTE PERITONITIS.

ETIOLOGY.—Peritonitis may be divided into certain varieties, according to its mode of causation, viz.: 1. *Traumatic*. This form may arise from mere external injury to the abdomen, penetrating wounds, or

rupture by violence of internal organs. It must be remarked, however, that the danger of peritonitis from direct injury has been much exaggerated, as the membrane is often considerably injured in operations without any particular harm resulting. 2. *Perforative*. The special causes of this important variety of peritonitis will be separately considered. 3. *Irritative*. In not a few instances peritonitis arises from some local irritation, being then either limited, or spreading throughout the sac. Thus it may be associated with diseases of organs; hernia or intestinal obstruction; ulceration of the bowels; morbid deposits; inflammation and abscess of the lacteal glands; or it may be the result of extension of inflammation through the diaphragm from the pleura or pericardium. The source of local irritation may be very obscure, requiring to be carefully sought after. 4. *Secondary*, from blood-poisoning. Peritonitis from this cause is especially important in connection with the puerperal state and Bright's disease. It may also be met with in the course of small-pox, typhoid fever, pyæmia, erysipelas, glanders, gout, rheumatic fever, and other diseases. In some of these cases it has been supposed to be metastatic. 5. *Idiopathic*. Under this head are included those cases which cannot be traced to either class of causes previously mentioned, but which are attributed to cold, overeating or drinking, and other injurious influences. Many doubt the existence of this variety, but exceptional cases come under observation which certainly seem to come fairly under this class. 6. *Puerperal peritonitis* can probably be conveyed by contagion.

Predisposing Causes.—Children are only very rarely attacked with acute general peritonitis, and in them it is usually associated with some exanthematous fever. Certain forms of blood-poisoning, but especially that connected with renal disease, are very favorable to peritonitis from any slight irritation. Puerperal peritonitis may assume an epidemic form.

ANATOMICAL CHARACTERS.—The special features in the morbid anatomy of peritonitis which seem worthy of notice are as follows: The vascularization is often very intense, and is most marked where the coils of intestines touch. The subserous tissue as well as the muscular coat of the alimentary canal are usually much sodden, infiltrated, and softened. The lymph, though not uncommonly tolerably firm, matting together the coils of intestines, yet appears to be more frequently of a soft, non-organizable nature than in other serous inflammations, and flakes of it are always detached in abundance, or even gelatinous-looking masses of considerable size. In some instances it presents a greasy aspect. The effusion is as a rule comparatively small in quantity, and the explanation of this may be that the intestines are generally so distended with gas that they prevent much accumulation of fluid. This fluid is always more or less flaky and turbid, and not uncommonly presents an almost purulent appearance, occasionally being actually

purulent, especially in puerperal and other low forms of peritonitis. Sometimes there is an admixture of blood. Much fetid gas is frequently present in the peritoneal sac, and in certain cases foreign materials. Gangrene is occasionally observed. The morbid products of peritonitis are in some instances of the most virulently septic character, and the introduction of the minutest quantity into the system is highly dangerous; hence special care should always be taken in conducting a post-mortem examination in these cases.

According to the extent of the inflammation peritonitis is named *general* or *local*, the former term merely indicating that it is extensive, for the entire surface is but rarely involved. The local varieties are named according to the part affected, such as parietal, hepatic, omental, or nephritic.

Should recovery take place, thickenings, agglutinations, and bands of adhesion form, which subsequently may prove highly dangerous.

SYMPTOMS.—Peritonitis presents considerable variations in its clinical history, but it will be convenient first to consider a typical case, and then point out the principal forms which call for special notice.

The onset of the disease is usually definite and marked, being attended with distinct, often severe and repeated rigors. These are soon followed, sometimes accompanied, or rarely even preceded by local symptoms referable to the abdomen and its contents; with evidences of constitutional disturbance. Some of the main symptoms are due to the irritation of organs excited by the inflamed peritoneum; or to paralysis of the muscular coat of the hollow viscera, especially of the stomach and bowels.

Pain over the abdomen is in most cases a prominent symptom. It usually begins locally, especially below, but may ultimately extend over the entire surface, though it is frequently more marked in one region. Its intensity and characters vary much, but it is generally very severe, sometimes agonizing; and hot, burning, shooting, or darting in character. Any disturbance of the parts increases it considerably, as by change of posture, a deep breath, coughing, vomiting, defecation, or even the movement of flatus in the intestines. There is extreme tenderness, especially on making deep and limited pressure, but in some cases even the weight of the bedclothes cannot be borne. The alimentary canal is gravely affected, as evidenced by a very small, irritable, red tongue, slightly furred, and tending to dryness; complete loss of appetite, with great thirst; nausea and vomiting of everything swallowed; and absolute constipation.

The appearance of the patient is often highly characteristic. The face, pale or flushed, presents an expression of evident suffering and grave constitutional disorder combined with anxiety, the features being drawn and pinched. There is much prostration, with general uneasiness and restlessness, but though the arms may be thrown about, the

patient keeps the body perfectly still, on account of the pain which movement causes, and instinctively assumes a characteristic posture, with the view of relaxing the abdominal muscles, viz., lying on the back, with the head and shoulders raised, and the knees drawn up.

Pyrexia is usually, but not always, present to a very marked degree; while there is no regularity in the temperature. The pulse is increased in frequency, ranging from 100 to 150 or more, small, sharp, often hard and wiry or thready; in bad cases it tends to become extremely frequent, feeble, and irregular. The blood is, in many cases, highly hyperinotic. Respiration is hurried but shallow; persistent hiccup causes much distress in some cases. The urine is markedly febrile, and not uncommonly contains albumen. It may be almost suppressed or retained. Micturition is sometimes very frequent. As a rule no particular cerebral symptoms are observed, except headache and sleeplessness; in bad cases, however, low muttering delirium may set in, or in puerperal peritonitis this is sometimes of a wild type.

Physical examination of the abdomen reveals some important signs, viz.: 1. Tympanitic distension, often extreme. 2. Absolute cessation of all abdominal respiratory movements. 3. Occasionally friction-fremitus or sound, if the patient can be made to breathe deeply, especially over the liver, due to the presence of lymph. 4. Usually signs of a certain amount of fluid, viz., dullness in dependent parts, with in some instances a sense of fluctuation, movable with change of posture.

COURSE AND TERMINATIONS.—Peritonitis is a very fatal disease, death being usually preceded by extreme prostration and collapse, as indicated by the aspect of the features; cold, clammy sweats; coldness of the extremities, and an extremely rapid, feeble, and irregular pulse. The pain in the abdomen often ceases, sometimes suddenly, and the tympanitis may disappear. Sometimes large quantities of a dark fluid containing altered blood are expelled from the stomach and bowels without any effort. Low nervous symptoms usually set in, but the intellect may be clear almost to the last. Occasionally death seems to result from asphyxia or coma. Should recovery take place there is a gradual subsidence of the symptoms, and among the chief signs of improvement are a change in the expression; increase in the force and fulness of the pulse, with a more satisfactory sphygmographic tracing; relief of constipation, and increase in the quantity of urine. Peritonitis is said to terminate occasionally by crisis with critical discharges, but this must be an extremely rare event.

VARIETIES.—The special forms of peritonitis requiring notice are as follows: 1. *Perforative*, which will be separately considered. 2. *Latent*. Cases are sometimes observed in which there is extensive peritonitis without any symptoms at all, or none of any definite character. This may be due to the mental condition of the patient, but not always. A remarkable illustration of this variety came under my care at University

Hospital, in which there were absolutely no signs of peritonitis, and yet this was the only lesion found after death. 3. *Adynamic*. Here there is a rapid tendency towards the typhoid condition, with a dry and brown tongue, sordes on the teeth, and low nervous symptoms. 4. *Erysipelatous*. Puerperal peritonitis is the best illustration of this form, in which the inflammation is very extensive, intense, and rapid in its progress, the products being remarkably non-plastic, consisting chiefly of a purulent-looking fluid, often very abundant. The symptoms are proportionately severe, and of a low type. It is also observed after low fevers sometimes, and in pyæmia. 5. *Local*. When peritonitis is limited to, or more marked over, some particular organ, the pain may be localized, and symptoms connected with this special organ become prominent. When the parietal peritoneum or great omentum is involved, there is severe superficial pain, with marked tenderness. 6. The symptoms of peritonitis may be modified by complications. Of these the most important is enteritis, which may give rise to diarrhœa instead of constipation.

DIAGNOSIS.—It is important to bear in mind the possibility of peritonitis being latent, should there be any condition present likely to originate this disease. The principal affections from which it has to be distinguished are cramp or colic, muscular rheumatism of the abdominal walls, enteritis, enteralgia and other neuralgic pains within the abdomen, the passage of a gallstone, and certain cases of hysteria, attended with tympanitis and other local symptoms closely simulating peritonitis. The diagnosis is founded on: 1. The history of the case, as to the exciting cause and mode of onset. 2. The aspect of the patient, which usually suggests grave constitutional disturbance in peritonitis, while there is no evidence of hysteria. 3. The posture of the patient, and state of absolute rest as regards the body. 4. Local symptoms, especially the severity and characters of the pain; marked tenderness, which is not merely superficial but also deep; vomiting; and constipation. 5. Physical signs, as evidencing great tympanitis, with some fluid, and possibly the presence of lymph. 6. The existence of more or less pyrexia, often accompanied with special characters of the pulse, tongue, and urine.

PROGNOSIS.—Peritonitis is always a highly dangerous affection, but its gravity differs materially according to its cause. Perforative peritonitis is extremely fatal; and next in order come puerperal peritonitis and those cases associated with pyæmia and other forms of blood-poisoning. Traumatic and local varieties are much less serious. Low symptoms are unfavorable, and the condition of the pulse, especially as revealed by the sphygmograph, will assist in determining the prognosis. The duration of fatal cases may vary from twenty-four or forty-eight hours to three or four weeks; they do not often extend beyond a week.

TREATMENT.—No exact rules for the treatment of peritonitis can be laid down, as this has to be materially modified in different cases, and it will be only practicable to indicate the general principles which are to be followed, and the main remedies for carrying them out. It must be premised that any cause which is setting up or intensifying peritonitis must be at once removed if possible, and should be carefully sought for in doubtful cases, as, for instance, an intestinal hernia. The main principles of treatment are: 1. To procure rest for the affected parts. 2. To subdue the inflammation and aid in the removal of the inflammatory products. 3. To sustain the strength of the patient. 4. To treat various symptoms.

The removal of blood by venesection, or by the application of a large number of leeches over the abdomen, is a measure which is very commonly adopted in the treatment of peritonitis, and certainly it seems to be more serviceable in this than in other serous inflammations; but at the same time there are very many cases for which bleeding is by no means suitable, and all the circumstances must be carefully considered before having recourse to this treatment. It is when extensive peritonitis occurs in a healthy, strong, and plethoric subject that withdrawal of blood is indicated, and then only in the early stages of its progress. When the disease is associated with blood-poisoning or a low condition of the system; if the patient is weak, either constitutionally or from any pre-existing illness; or if the inflammatory process is far advanced, it is decidedly injurious to take away any blood. The balance of evidence is opposed to bleeding in puerperal peritonitis. The application of leeches is much preferable to venesection, the number employed varying from ten to twenty, thirty, or even more in appropriate cases. Mercurialization, by means of calomel administered with opium, is another very common mode of treatment, but it appears to me to be as useless or injurious in this as in other serous inflammations.

Opium is a remedy of the utmost importance. It not only relieves symptoms, especially pain and vomiting, but also prevents the peristaltic action of the bowels, and thus contributes greatly to the maintenance of rest. It is best given in the form of pill, gr. $\frac{1}{2}$ –ij, repeated every two, three, or four hours according to circumstances. If there is renal disease, opium can only be employed very cautiously. Morphia, either administered as a pill, gr. $\frac{1}{4}$ – $\frac{1}{2}$; or by subcutaneous injection, is also highly valuable in some cases. Where the stomach is extremely irritable tincture of opium may be introduced by enema. Other anodynes may be given when opium is inadmissible. Quinine in full doses has been recommended, and in low forms of peritonitis it might probably be administered with much advantage along with opium.

The diet requires the most careful attention. Only liquids should be given, cool or even cold, and they must be administered in small and

definite quantities at stated intervals. Frequently abundant nutriment is required, especially milk and well-made beef tea. In many instances also alcoholic stimulants are needed, and in low cases these are the only remedies on which reliance can be placed. The sucking of ice is highly to be commended; or small quantities of iced drinks might be allowed. In many cases it is requisite to have recourse to nutrient enemata, especially when the stomach is very irritable.

Local applications over the abdomen are of decided value. The best are hot linseed-meal poultices, not too heavy, sprinkled over with laudanum, and changed frequently. Warm anodyne or turpentine fomentations are also useful, for applying which spongio-piline is of service, as well as sinapisms. Some recommend the employment of cold compresses frequently changed. In the more advanced stages a blister might be beneficial in some cases. It is often desirable to employ some apparatus for keeping off the weight of the bedclothes from the abdomen.

The chief symptoms requiring attention are pain; vomiting; tympanitis; constipation or diarrhœa; urgent dyspnœa; and those indicative of adynamia. The remedies already considered will assist in relieving most of these symptoms. Small quantities of an effervescent mixture with hydrocyanic acid and morphia; soda-water and milk; the sucking of lumps of ice; or creasote, may diminish the sickness. Tympanitis is best relieved by enemata of turpentine; or the passage of a long tube per rectum. Puncture of the colon with a minute trocar may be had recourse to in extreme cases if other measures fail. With regard to constipation, in some instances it is desirable to endeavor to clear out the bowels at the outset by a full dose of calomel, and afterwards to employ enemata; but when there is perforation, on no account must the bowels be disturbed. Diarrhœa is best treated by enemata of opium. Dyspnœa is usually relieved by removing the tympanitic condition. Adynamic symptoms require ammonia and bark, or turpentine internally; along with abundance of alcoholic stimulants and nutritious liquid food.

II. CHRONIC PERITONITIS.

ETIOLOGY.—Chronic peritonitis is observed: 1. As the remains of one or more acute attacks. 2. After repeated paracentesis for ascites. 3. In connection with chronic diseases of organs, such as cirrhosis or cancer of the liver, chronic ulcer of the stomach or intestines. 4. Associated with some diathesis, especially when this leads to a morbid formation in the peritoneum, as of cancer or tubercle, but chronic peritonitis may also arise from Bright's disease, and possibly from rheumatism.

ANATOMICAL CHARACTERS.—These necessarily vary greatly, but in a general way they may be said to be thickening of the peritoneum, sometimes to an extreme degree; adhesions, in the form of bands or exten-

sive matting together of the organs; accumulation of more or less fluid, which ranges from mere serum to actual pus, or has an admixture of blood, and is often confined in loculi limited by the adhesions. In some cases large masses of organized lymph are seen; and much pigment is often present. Caseous degeneration may have taken place in parts; or cancer or tubercle may be evident.

SYMPTOMS.—In some cases there are no clinical evidences of chronic peritonitis, or only such as are very obscure; in others merely physical signs are observed. When present the symptoms include various subjective sensations in the abdomen; disturbance of the alimentary canal; sometimes evidences of pressure; with generally more or less constitutional disorders. Uneasiness or more or less actual pain is experienced, never severe, liable to come and go, often colicky, and increased by shaking the body. Sometimes there is a sense of soreness or heat. Tenderness is common, being frequently more marked in particular spots. The digestive organs are generally disturbed, but it is often difficult to say how far this is due to the peritonitis. This does, however, tend to give rise to constipation, and the bands of adhesion may lead to absolute intestinal obstruction. In tubercular peritonitis diarrhœa is common, owing to intestinal ulceration. Occasionally jaundice, ascites, or anasarca of the legs is observed, as the result of pressure on the common bile-duct or on different veins. More or less emaciation; a dry and harsh skin; occasionally pyrexia, with a tendency to hectic; and other symptoms often indicate constitutional disturbance, but it is probable that these are in most cases chiefly due to the condition with which the peritonitis is associated.

Physical examination often yields important information. 1. The abdomen is enlarged, and this may be the first thing which has attracted the patient's attention. The enlargement is never very great; usually regular, but not always quite symmetrical. 2. The sensations are seldom uniform over the entire surface. Fluctuation may be detected in parts, but only indistinctly; while it is often very limited, or is felt in unusual situations, owing to the fluid being inclosed in locular spaces. In other regions there may be a more firm and solid sensation, or even tumors may be detected sometimes. The abdomen may be movable as a whole. 3. Dulness is frequently very extensive, owing to the arrangement of the fluid, and may lie chiefly in front. In some instances tympanitic and dull sounds are heard over contiguous and irregular spots. There may be a sense of much resistance on percussion. 4. Friction-fremitus and sound can sometimes be detected. 5. Change of posture frequently does not produce much effect, on account of the fluid being loculated.

TREATMENT.—The main indication in most cases is to treat the constitutional state with which chronic peritonitis is associated, by means of cod-liver oil, tonics, mild ferruginous preparations, light nutritious

diet, a suitable climate, and proper hygienic conditions. Iodide of potassium or iodide of iron may be tried internally, with the view of removing the inflammatory products, as well as local counter-irritation over the abdomen, especially by iodine liniment or ointment. This region should be covered with cotton-wool and well bandaged. I have known considerable benefit follow in simple cases from systematic pressure by bandaging the abdomen. Pain and constipation must be relieved by the usual means, but caution must be exercised in giving opium, and also in administering strong purgatives. Hot-air or vapor-baths are useful if the peritoneum contains much fluid.

III. MORBID GROWTHS IN THE PERITONEUM.

The most important of these are tubercle and cancer. Hydatids are occasionally found, and very rarely other tumors. The folds of the peritoneum, especially the omentum, frequently inclose a great quantity of fat.

Tubercle occurs in the peritoneum, either over limited patches corresponding to intestinal ulcers; as a part of acute miliary tuberculosis; or extensively, secondary to tubercle in other parts.

Cancer is met with in the form of scirrhus, encephaloid, or colloid, the omentum being a comparatively frequent seat of the last-mentioned. Usually the peritoneum is involved secondarily by extension from one of the organs, but in rare instances it is affected primarily and solely.

These morbid growths tend to produce ascites or chronic peritonitis, and it is to these conditions that their local symptoms are mainly due. Sometimes fluid collects with extreme rapidity in cancer. Colloid in the omentum yields the following physical signs: 1. The enlargement of the abdomen may be very great, but is wanting in uniformity; the umbilicus appears stretched, but not everted. 2. Firm irregular masses can generally be felt, and even if fluid is present, fluctuation is very indistinct. 3. Dulness is usually elicited over the front of the abdomen. 4. Change of posture produces no effect, unless there is much fluid present. 5. The aspirateur or exploratory trocar may bring away a slimy gelatinous fluid; and this is occasionally discharged by vomiting or per rectum.

IV. ABDOMINAL PERFORATIONS AND RUPTURES.

Apart from the effects of traumatic injury, perforations and ruptures are liable to take place in connection with the abdominal contents, and in order to avoid repetition it will be convenient to indicate the chief facts pertaining to this subject in the present chapter, as the peritoneum so commonly suffers in these cases.

ETIOLOGY AND PATHOLOGY.—The principal structures which are liable to give way, and the pathological conditions which cause these

lesions, may be thus stated: 1. Perforation of the stomach or intestines from within in connection with ulceration or the resulting cicatrices; gangrene; cancer; the action of corrosive poisons, especially on the stomach; or mechanical irritation and destruction, particularly by foreign bodies introduced from without, but sometimes merely by hardened feces, worms, or gallstones. It must be mentioned that extensive post-mortem softening and destruction of the coats of the stomach may, under certain circumstances, result from the action of the gastric juice. 2. Rupture of an abscess or hydatid cyst in the liver. 3. Perforation of the gall-bladder, either by gallstones which have caused ulceration; or from cancer. 4. Rupture of the spleen, from extreme enlargement and softening; or abscess. 5. Various ruptures in connection with the uterus and ovaries. 6. Bursting of any accumulation in the pelvis of the kidney; of an abscess or cyst in this organ; or of the bladder from over-distension. 7. Bursting of an abscess unconnected with any organ; or of a soft morbid accumulation in the glands. 8. Rupture of an aneurism. 9. Perforation of a hollow viscus from without, owing to the destruction of its coats by some solid tumor. 10. Bursting of a peritoneal accumulation. 11. Very rarely perforation of the diaphragm with escape of some fluid collection in the chest into the abdominal cavity.

These lesions usually occur without any immediate *exciting cause*, but certain of them may be brought on by some mechanical disturbance, such as vomiting, coughing, or laughing; straining at stool; or, in the case of ulceration of the alimentary canal, by taking excess of or irritating articles of food, or such as cause flatulent distension.

The perforation or rupture may take place into different parts, and the pathological and clinical consequences will vary accordingly. 1. Most frequently the opening communicates with the peritoneum, into which foreign matters are poured more or less freely, exciting *perforative peritonitis*, severe and rapid in proportion to the quantity and irritant nature of the materials thus introduced into the sac. 2. Sometimes the subperitoneal cellular tissue is the structure affected, local inflammation ending in abscesses being set up there. 3. Not uncommonly one hollow organ forms an adhesion with another, and when perforation occurs a communication is established between them; or the adhesion may be with a solid organ, and when perforation is completed, this may make up for the deficiency. 4. Union may be set up with the abdominal wall, the opening being consequently on the external surface.

SYMPTOMS.—From the facts just stated it will be evident that the symptoms indicating perforation must differ considerably, and there may be none at all, or death may be almost instantaneous, as from rupture of an aneurism. As a rule there have been previous evidences of some morbid condition in connection with which the lesion occurs.

Presuming it to be sudden and of any extent, and that the communication takes place into the peritoneal cavity, this is usually indicated by a sudden intense pain at the seat of rupture, often of a burning character, which spreads rapidly over the abdomen, being sometimes attended with a feeling as if something were pouring out; at the same time there are the ordinary signs of more or less collapse or shock, and death may rapidly ensue from this cause. Should the patient rally, peritonitis will be speedily set up, the peculiar features of which are that the local symptoms precede any rigors; that the pain starts from a certain spot; that the course is usually very rapid; and the termination almost always fatal. If the perforation takes place into the cellular tissue, there will be signs of local inflammation followed by abscess, with general pyrexia. The attacks of pain and collapse may be repeated, this probably indicating extension of the perforation, or the formation of fresh communications.

TREATMENT.—In any case of perforation the patient must be kept absolutely at rest, and this applies still more emphatically to the organ which is the seat of the lesion. In the case of the stomach or bowels, there should be complete abstinence from food by the mouth, and only small enemata administered. Opium is the great remedy for the purpose of counteracting shock, relieving pain, and checking peristaltic action. It should be given in full doses, at short intervals. Collapse must also be treated by free administration of stimulants, which, if the alimentary canal is affected, must be given by enemata; heat to the extremities; and sinapisms. Hot fomentations may be applied over the abdomen. Should peritonitis or other inflammation be set up, the usual treatment must be adopted. After perforation of the stomach and intestines, it is extremely important to avoid giving anything by the mouth for some time; and to refrain from any attempt to act upon the bowels by aperients.

V. ASCITES—DROPSY OF THE PERITONEUM.

ETIOLOGY.—Ascites is merely a localized dropsy of the peritoneum, and may be the result of: 1. Pressure upon the branches of the portal vein within the liver, especially from cirrhosis and other forms of chronic contraction of the liver; or infiltrated cancer. 2. Pressure upon the portal trunk in the fissure outside the liver. It is from this cause that ascites is most frequently associated with many diseases of the liver, such as cancer, albuminoid disease, hydatids, or abscess; either projections from the liver pressing on the vein, or the glands in the fissure being simultaneously affected. Inflammatory thickening from perihepatitis; any tumor in the vicinity; or an aneurism may also cause pressure. 3. Internal obstruction of the portal vein by a thrombus. 4. Pressure upon the inferior vena cava, after it receives the hepatic

trunk. 5. Cardiac diseases obstructing the venous circulation, these in time giving rise to organic changes in the liver. 6. Renal disease. 7. Morbid deposits in the peritoneum, which are supposed to act by inducing active congestion, but which probably chiefly originate dropsy by pressure upon the small vessels. 8. Exposure to cold; suppression of discharges or chronic skin diseases; and other causes which may lead to internal active congestion. The reality of this class of causes is questionable, but cases of ascites have been attributed to them.

ANATOMICAL CHARACTERS.—The quantity of dropsical fluid which may collect in the peritoneum varies extremely, often amounting to several gallons; it distends and macerates the tissues in proportion to its amount. In characters it is usually in the main watery in consistency; clear and transparent; colorless or faintly yellow; alkaline in reaction, or very rarely neutral or acid. It may be turbid, dirty-looking, or stained by bile or blood, gelatinous, or mixed with soft fibrinous masses. Its composition is far from being uniform, but generally it contains much albumen; occasionally it yields fibrin, urea, or cholesterolin.

SYMPTOMS.—The only symptoms directly due to ascites are those dependent upon the mechanical effects of the fluid. There is more or less discomfort and sense of fulness in proportion to its quantity. Digestive disturbances are common, flatulence and constipation being prominent symptoms; sometimes vomiting takes place. Owing to the interference with the diaphragm, dyspnoea is complained of, and may be urgent, being much increased often by flatulence. The heart's action may also be disturbed, as evidenced by palpitation, irregularity, or sometimes a tendency to syncope. Anasarca of the legs frequently follows ascites, resulting from pressure by the fluid on the vena cava, which also leads to enlargement of the veins of the abdominal walls. When caused by pressure on the vena cava, of course anasarca of the legs is observed simultaneously with or even before the ascites. Albuminuria may be induced by pressure on the renal veins.

PHYSICAL SIGNS.—These require careful consideration, and in the majority of cases they are sufficiently characteristic, but they necessarily depend upon the quantity of fluid present. 1. The skin usually appears stretched to a variable degree, smooth, and shining, feeling thin; the superficial veins are often enlarged; and the umbilicus is stretched, everted, or pouched out, and becomes finally obliterated. 2. The abdomen is more or less enlarged, in some cases enormously; quite symmetrical; and of a rounded form, though it tends to bulge in the flanks or in the hypogastric and iliac regions, according to the position of the patient; the greatest circumference is about the level of the umbilicus, which is the highest point of the abdomen; the thorax appears small and depressed, and its lower margin may be everted, or the ensiform cartilage bent sharply up. Usually a history can be obtained

that the enlargement commenced below ; and that it increased steadily, though slowly in most cases. 3. Abdominal respiratory movements are frequently either deficient or absent. 4. The surface feels quite regular and uniform ; and fluctuation is generally readily elicited from side to side. 5. Dulness is observed first towards the lumbar regions, if the patient lies in the supine position ; then in the lower part of the abdomen ; and it extends by degrees towards the front and upwards, until finally it may be observed all over the abdomen. The umbilical region retains the tympanitic sound longest, and it is often excessive here. When the patient sits up, the prominence between the recti becomes tympanitic. 6. Auscultation is negative. 7. Change of posture gives important signs, viz., the fluid can occasionally be seen moving ; the form of the abdomen is altered, bulging being observed in the most dependent part ; while the seat of dulness and fluctuation is changed. 8. Examination per rectum reveals the sensation of the resistance of fluid. 9. Examination per vaginam indicates that the vagina is short, and the uterus pushed down or flexed. 10. Any fluid removed usually consists of mere serum, containing generally a considerable amount of albumen. 11. The heart may be displaced upwards and to the left, occasionally a basic murmur being thus originated.

DIAGNOSIS.—There are two points in the diagnosis of ascites, viz.: 1. To determine whether fluid is present ; and to distinguish enlargement due to this cause from that dependent upon other morbid conditions. 2. To make out its pathological cause. The chief general abdominal enlargements which may simulate ascites are those associated with great obesity, with much fat in the omentum ; a flabby relaxed state of the walls, with flatulence ; considerable subcutaneous œdema ; peritonitis, especially chronic ; colloid in the omentum ; a greatly dilated stomach ; an ovarian tumor ; distension of the uterus with fluid, or pregnancy ; an extremely distended bladder ; a large hydatid tumor in connection with the liver or any other structure ; an enormous cyst in the kidney ; and a phantom tumor.

It is by *physical examination* that ascites is mainly distinguished from the conditions just enumerated, but it is important to observe that its ordinary signs may be modified or obscured by some of them ; by its association with a tumor, morbid deposit, or enlarged organ ; by the fluid being either very small in quantity, or on the other hand extremely abundant ; by the mesentery being so short as not to allow the intestines to come forward ; and by the existence of adhesions limiting the fluid. When ascites is associated with any solid enlargement, the latter may frequently be recognized by making sudden firm pressure with the fingers, by which the fluid is pushed aside and the firm mass reached ; or in doubtful cases the fluid can be removed, and satisfactory examination then carried out.

Important aid in the diagnosis may also be derived from : 1. A care-

ful general history of the case; and the conditions of the patient with respect to age and general appearance. 2. The history of the enlargement, as to whether it has been more or less acute or chronic in its progress, and whether it has fluctuated or steadily progressed; as well as its seat of origin and direction of increase. 3. The accompanying symptoms; and the condition of the main organs, which should all be thoroughly examined. 4. The results of treatment, not forgetting the use of the aspirateur or trocar; of the catheter; and of means for clearing out the alimentary canal.

The characters of most of the enlargements mentioned above are described in other parts of this work, to which descriptions reference must be made for individual diagnosis. It is necessary, however, to point out specially the characters distinguishing cystic tumor of the ovary from ascites. 1. *Physical signs.* (i.) The umbilicus is often thinned and flattened out, but not everted or pouched out. (ii.) The enlargement is not so globular in shape; projects anteriorly; does not bulge in dependent parts; and is frequently not quite symmetrical, this being accurately determined by semicircular measurements, or by comparing the distance from the umbilicus to the anterior superior iliac spine on each side. The greatest circumference is said to be about an inch below the umbilicus, in the recumbent posture; and the measurement from the ensiform cartilage to the umbilicus is generally shortened. (iii.) As a rule fluctuation is indistinct; the enlargement feels more or less firm and resistant or even nodulated; while the sensations are not uniform over the entire surface. Frequently, on deep pressure greater resistance or tension is felt on one side than the other. (iv.) Percussion reveals dulness chiefly in front of the abdomen, even in the umbilical region, while the flanks are tympanitic, and the dulness often extends more towards one side than the other. The prominence between the recti in the sitting posture is dull. There is usually a sense of considerable resistance on percussion. (v.) Auscultation may detect a pressure-murmur over one iliac artery. (vi.) Change of posture does not produce the alterations observed in ascites. (vii.) Examination per rectum detects a firm resistance. (viii.) The vagina is long and narrow above, the uterus being raised. (ix.) An exploratory trocar may bring away a thick, glutinous, or colored fluid, which sometimes contains cholesterin; and after this has been removed solid portions of the tumor may be felt more readily. 2. There is no history of any cause, or evidence of any organic disease likely to originate ascites. 3. Frequently the patient has observed that the enlargement commenced below, and from one side. 4. Symptoms which often accompany ascites are absent; while anasarca of the legs is commonly an early symptom of ovarian tumor, owing to pressure on the veins, which may be entirely or chiefly confined to one side.

With regard to the diagnosis of the cause of ascites, this can gener-

ally be made out by satisfactory examination as regards history, symptoms, and physical signs, directed to the liver, heart, and kidneys; the distinctive characters referable to the ascites itself are pointed out in the chapter on Dropsy. Obscure causes can only be determined by exclusion, and by a thorough consideration of all the circumstances of the individual case.

TREATMENT.—In addition to the ordinary measures adopted in the treatment of dropsy, there are two which demand special notice in connection with ascites, viz., paracentesis, and the employment of pressure. It has been the custom to look upon paracentesis as an operation which should only be performed as a last resource, when the fluid has collected to such a degree as to cause urgent symptoms. When the ascites is a part of general dropsy from cardiac or renal disease, the amount of fluid is not often so great as to need its removal by operation, nor could this serve any beneficial purpose, except in affording temporary relief. The last remark applies also to many cases in which it is merely a local dropsy; but there is one class of cases in which paracentesis may not uncommonly be performed as a curative measure, so far as the ascites is concerned, viz., when it is dependent upon cirrhosis of the liver. In such cases I have for some time had recourse to repeated paracentesis as a systematic method of treatment, the fluid being taken away again and again should it reaccumulate, and the results have been most satisfactory, due care being of course exercised in the performance of the operation, and in the subsequent management of the case. I have published some observations on this subject in the *Practitioner*, and since then several other cases have been under my care, in which this treatment has proved highly successful. Other observers have also recorded favorable results from this operation, and therefore it appears to me justifiable to insist upon the employment of paracentesis abdominis as a means of cure in connection with ascites from uncomplicated cirrhosis of the liver, should the fluid be at all abundant and show no signs of being removed by other treatment. I am aware that cases have been recorded in which recovery has followed merely general tonic and other modes of treatment, but this is such a rare event that sole reliance cannot be placed on these remedies, though they aid materially the treatment by operation. This may also be assisted by pressure, the abdomen being tightly bound by a broad roller as soon as all danger of undue irritation has ceased, from which much benefit often results. I may state that never has any injurious consequence followed the operation within my experience, and in some almost hopeless cases permanent recovery has been brought about. The employment of poultices of digitalis-leaves along with pressure has appeared to do good in some instances.

CHAPTER XXXI.

DISEASES OF THE STOMACH AND INTESTINES.

CLINICAL CHARACTERS.—Symptoms referable to the alimentary canal are of such common occurrence, that it has rightly become a matter of routine in the examination of a patient to make inquiry concerning them. The succeeding general sketch will indicate the clinical phenomena which may be met with, and the course to be pursued in their investigation :

1. Morbid sensations are very commonly experienced over some part of the abdomen, the principal being pain or tenderness ; heat or burning in the epigastrium ; a sense of sinking, dragging, or tightness ; discomfort, weight, and fulness after food, or on the other hand a feeling of emptiness even after a full meal, with constant craving for food ; and abnormal movements within the abdomen. *Cardialgia* or *heartburn* are terms applied to a peculiar sensation of heat or burning in the epigastrium, which extends upwards, as if along the œsophagus, to the throat ; or in some cases spreads more or less over the chest. With regard to pain, it is very important not only to investigate it carefully in all the usual particulars, but also in many cases to ascertain whether and in what way it is influenced by food or drink in general, or by special articles of diet ; by vomiting or eructation ; defecation or the passage of flatus ; posture or movement ; coughing or deep inspiration ; mental disturbance ; or, in certain instances, by the periods of menstruation. In determining whether there is tenderness, it is well to take off the patient's attention, and its site and extent, degree, and apparent depth must be made out as accurately as possible, while it must be noted whether it appears to be connected with any evident morbid condition, such as a tumor. These remarks apply to all kinds of abdominal pain or tenderness. When the stomach is affected, uncomfortable or painful sensations are often referred to the back between the shoulders ; or to the front of the chest.

2. The sensations as regards inclination for food and drink are often altered. Appetite may be deficient or lost (*anorexia*), in some cases the feeling amounting to a complete disgust for food ; excessive both as to quantity and frequency (*bulimia*) ; attended with a desire or dislike for special articles ; or altogether depraved. Thirst is a frequent symptom, and there may be a particular inclination for certain drinks ; on the other hand an antipathy to fluids is sometimes observed.

3. The process of digestion is frequently interfered with. Hence decomposition or fermentation is set up in the contents of the alimentary canal, leading to the production of gases ; occasionally of alcohol ; various acids (lactic, butyric, acetic, etc.) ; or vegetable growths (*sarcinæ ventriculi* and *torulæ*). Great discomfort may thus arise from flatulent distension, gurgling (*borborygmi*), or acidity.

4. Acts are excited in connection with the stomach with the view of expelling offending materials, viz., vomiting and retching, which may or may not be attended with a feeling of nausea ; regurgitation of food ; or eructation of gases, liquids, and other substances. With regard to the mechanism of these acts, vomiting is not only attended with contraction of the muscular coat of the stomach, but also of the abdominal and thoracic muscles, while the cardiac end of the œsophagus is relaxed ; retching is the same act, but ineffectual, only air being expelled, either because the stomach is empty, or because the lower portion of the œsophagus is spasmodically

closed. Regurgitation and eructation are merely due to contraction of the stomach, and some individuals can regurgitate their food at will. In infants the vomiting appears to be much of this character. A special form of eructation or regurgitation has been named *pyrosis* or *waterbrash*, in which, often after painful sensations in the epigastrium, especially a sense of burning, a quantity of clear watery fluid rises into the mouth, generally tasteless and neutral, but in some cases sour or acrid and acid in reaction. This fluid has been supposed by some to be mainly saliva; others have considered it to be pancreatic juice; but probably most of it comes from the stomach.

5. Blood may be poured out into the alimentary canal, and either rejected from the stomach (*hæmatemesia*); or passed by the bowels (*melæna*).

6. The bowels are very commonly irregular in their action, either in the direction of *constipation* or *diarrhœa*. It is frequently desirable to make particular inquiry into this matter, as patients offer general statements which may easily mislead. The chief points to be ascertained are the frequency of the act of defecation; whether attended by any straining; whether any unusual sensations precede, accompany, or follow it; and the quantity and characters of the materials discharged. In many cases it is imperative to make a personal examination of the stools, noticing their amount; color; general appearance; consistence; the form and size of any solid feces; odor; if there are any signs of fermentation or aeration; general composition, the materials to be specially looked for, in addition to ordinary feces, being various articles of food, either unaltered or more or less digested; foreign bodies introduced from without; calculi, especially hepatic; intestinal worms or hydatids; blood or altered blood; mucus or pus; fatty matter; fibrinous flocculi or casts; epithelial shreds; vegetable, animal, or mineral poisons; or, rarely, sloughs or portions of the intestines. Occasionally a chemical and microscopic examination is necessary, especially for the detection of poisons and parasites, or even merely to determine the composition of the feces.

7. The tongue gives important information as to the state of the digestive organs, the particulars to be noted being: *a.* Its size and shape, and whether it is marked by the teeth. *b.* The color of its mucous covering, especially at the tip and edges. *c.* Its condition as to dryness or moistness. *d.* The state of the surface, whether smooth, glazed, fissured, furrowed, etc. *e.* The size, shape, and color of the various papillæ. *f.* The presence, extent, and characters of any fur over the dorsum. It may be here mentioned also that the mouth and throat are frequently affected when the stomach is out of order; while a slimy or otherwise disagreeable taste is experienced, and the breath has an unpleasant odor.

8. In some cases abnormal sensations are experienced about the lower part of the rectum and anus, such as pain, either constant, or before, during, or after the act of defecation; fulness, weight, heat or burning, constriction, dragging, or frequent inclination to go to stool, with straining. Some of these are included under the term *tenesmus*. Hemorrhoids are frequently present also.

9. The methods of *physical examination* applicable to the alimentary canal have been previously indicated, and these are particularly useful in making out flatulent distension; tumor in connection with the stomach or intestines; accumulations in their interior; permanent dilatation of the stomach; and displacement, spasmodic contraction, or obstruction in the course of any part of the alimentary canal.

10. It will readily be understood that any derangement of the digestive organs is very likely to affect the system generally. Hence numerous symptoms arise, the most important being wasting, often accompanied with a sallow or anæmic aspect; a sense of debility, general discomfort, languor, malaise, and fatigue, with incapacity for effort, especially in the mornings and after meals; more or less pyrexia, with a dry and harsh skin, or on the other hand a depression of temperature, with

cold extremities and sweats; nervous symptoms, viz., congestive or neuralgic headache or a feeling of weight and oppression in the head, giddiness, irritability and petulance, depression of spirits and apathy, inaptitude for any mental effort, confusion of ideas and failure in intellectual vigor, hypochondriasis, wakefulness or drowsiness with restless and unrefreshing sleep attended with disagreeable dreams, timidity and nervousness, pains in the limbs and back, chilliness or even rigors, especially in the evenings, creeping sensations over the body, or convulsions in children; disturbance of the heart's action, in the way of palpitation or irregularity, feebleness, sometimes accompanied with faintness or actual syncope, as well as uncomfortable sensations in the cardiac region, the pulse being weak; dyspnoea, hiccough, or asthmatic attacks; oppression across the chest and cough; changes in the urine, especially indicated by excess of lithates or sometimes of phosphates or oxalates, excess or deficiency in acidity, and deficiency in chlorides; menstrual derangements; and skin eruptions, such as urticaria, herpes, and psoriasis. It must be remarked that a tumor or solid accumulation in connection with the stomach or intestines may press on neighboring structures, and thus originate symptoms.

CHAPTER XXXII.

ON CERTAIN GASTRIC SYMPTOMS AND FUNCTIONAL DISORDERS.

IN this chapter the chief symptoms and functional affections connected with the stomach will be considered; the diagnosis, prognosis, and treatment of the more chronic complaints will, however, be referred to in a subsequent general chapter on this subject.

I. GASTRODYNIA—GASTRALGIA.

ETIOLOGY.—These terms indicate a painful neuralgic affection of the stomach, chiefly met with among females, especially about the time of puberty, or when the menstrual functions are declining. The conditions with which it is mainly associated are physical exhaustion and debility; anæmia; hysteria; hypochondriasis; nervous exhaustion from depressing emotions, anxiety, or excessive mental effort; gout or rheumatism; uterine or ovarian derangements, including pregnancy. Sedentary habits, with habitual constipation, and excessive use of hot tea have appeared to me to have had considerable influence in bringing on this affection in some cases. Occasionally it results from the action of malaria; and in rare instances depends on central nervous disease.

SYMPTOMS.—The prominent symptom is epigastric pain, varying much in severity and characters, usually paroxysmal, and coming on either at regular or irregular intervals, though in many cases there is never complete relief. During the paroxysms the suffering may be extreme, especially in hysteria and gout. Food frequently gives decided

relief, the pain returning as the stomach becomes empty. Sometimes indigestible substances afford more ease than those which are digestible and soothing. Some patients, however, suffer intensely when they take anything, or after particular articles, such as hot tea. Pressure generally relieves, especially when made firmly and continuously, but there may be much superficial tenderness. Various curious sensations are often complained of in the epigastrium. During the severe attacks of pain, spasmodic movements of the stomach and bowels may be observed, with cramps of the abdominal muscles. Dyspeptic symptoms are habitually present in most cases, such as acid and gaseous eructations, flatulency, heartburn, or pyrosis. The tongue may be fairly natural. In hysterical cases chronic vomiting is sometimes a very distressing symptom; and not uncommonly a morbid craving exists for improper and indigestible articles of food. The bowels are generally very constipated. Frequently other nervous disturbances are observed. In some instances there is considerable emaciation, especially if food is not taken; but it is remarkable what a slight degree of wasting may attend the chronic vomiting of hysteria. Aortic pulsation is often present.

II. SPASM OR CRAMP OF THE STOMACH.

ETIOLOGY.—This differs from *gastralgia* in being an acute affection, and attended with spasmodic contraction of the walls of the stomach, which may be excited by indigestible or irritating food or drink, or in some individuals by special articles of diet ordinarily quite harmless; drinking excess of cold water, or indulging too freely in ices, especially when the stomach is empty; acrid secretions in the stomach; flatulent distension; mental emotion; and gout.

SYMPTOMS.—There is intense pain, which comes on suddenly in a series of paroxysms with remissions, being of a griping, constrictive, or twisting character. It is most marked near the pylorus, but may be felt running across the epigastrium, or even up along the *œsophagus*. Pressure gives marked relief, the patient sitting up and making firm pressure over the stomach, lying upon it, or tossing and rolling about. Often a feeling of sickness is experienced, and the pain may be eased by vomiting. More or less prostration is frequently observed, and occasionally even severe collapse, with cold and clammy sweats, a very feeble and slow pulse, and fluttering of the heart, which condition may actually terminate in death. Sometimes the spasmodic movements of the stomach can be felt externally. If they continue for some time, a little soreness and tenderness remain, but these sensations soon pass off.

TREATMENT.—Should there be any irritating materials in the stomach, an emetic of sulphate of zinc or mustard, with plenty of lukewarm water, should be given immediately. Spirits of ammonia, spirits of chloroform, tincture of opium, with some carminative, will generally relieve the pain. If there is acidity, carbonate of soda or magnesia

may be also administered. A little brandy or gin with hot water is often very useful. The continuous external application of dry heat over the abdomen, by means of hot plates or bags of bran or salt, is most soothing. After the attack it may be well to clear out the alimentary canal by means of a brisk purgative.

III. VOMITING.

ETIOLOGY.—The act of vomiting is excited either through some reflex irritation; or by a direct disturbance of the brain, affecting the stomach through the vagus nerves. Its numerous causes may be classed thus: 1. Those immediately acting upon the stomach, viz., irritating materials in its interior, whether introduced from without or formed there; organic diseases of its coats; obstruction at the pyloric orifice; external pressure upon the organ; and displacements, *e. g.*, hernia through the diaphragm. 2. Reflex irritation from other sources, particularly the throat; intestines (hernia, worms); peritoneum; female genital organs (especially in connection with pregnancy); and testicles. Reflex vomiting also accompanies the passage of a gallstone or renal calculus, as well as other complaints attended with severe pain. It may arise in susceptible persons from any unpleasant smell, taste, or sight; or even from a sudden light. The vomiting which follows severe fits of coughing, especially in phthisis, comes under this head. 3. Centric or cerebral vomiting. The chief causes coming within this group are injury to or disease of the brain or its membranes, especially meningitis; cerebral anæmia or congestion; a poisoned state of the blood, the poison being either introduced from without (*e. g.*, alcohol and its products, tobacco, tartar emetic, chloroform, opium and its constituents, lobelia), or being generated within the body, as in various febrile disorders, especially at the outset, uræmia, or from the inhalation of a hot and tainted atmosphere; mere nervous shock or fright; hysteria and other so-called functional nervous derangements, the vomiting being then probably the result of disordered circulation; and the imagination of unpleasant things. With regard to sea-sickness and other allied forms of vomiting, such as that brought on by swinging, these certainly come mainly within this class, but several theories have been proposed to explain the occurrence of this symptom under these circumstances. The peculiar movements, the appearance of objects in motion, and the unpleasant odors and sights usually present probably all aid in inducing sea-sickness, though some authorities regard it as entirely due to a peculiar disturbance of the cerebral circulation. Vomiting is a prominent symptom in migraine or sick headache. Morning sickness is often associated with chronic alcoholism, being partly the result of the presence of deleterious materials in the blood; partly of catarrh of the throat and stomach, the former giving rise to fits of cough. It must not be forgotten that malingerers can sometimes excite vomiting at will.

CLINICAL CHARACTERS.—It is frequently requisite to make thorough investigation with regard to vomiting, in order to arrive at a correct diagnosis as to its cause, the following particulars being noted: 1. The times and frequency of its occurrence. 2. The circumstances under which it takes place, whether spontaneously; only when the stomach is empty; after any food or drink, or only after certain articles or meals, it being important also to ascertain the quantity necessary to induce vomiting, and how soon it follows the introduction of the exciting materials; in connection with some obvious reflex or centric cause, such as cough, irritation in the throat, severe pain, a bad smell or taste, smoking, drinking, or mental disturbance; in certain positions or on change of posture. It must not be forgotten that many poisons excite vomiting, and suspicious cases might come under observation needing complete and cautious investigation as to substances which had been taken, or some of these might even be required for chemical examination. 3. The sensations preceding and accompanying the act, especially noting if there is any feeling of nausea, as well as its degree; giddiness; prostration; or pain. 4. The manner in which the act is performed, this being determined by personal inspection if possible, especially remarking if it appears to be originated voluntarily; and whether it is performed easily or with more or less straining and retching. 5. The after-effects, particularly as regards the relief of gastric pain or its intensification; and the influence upon cerebral symptoms. It may be mentioned here that the mere violence of vomiting may occasion serious lesions, such as rupture of the stomach or a vessel, apoplexy, or hernia, and it often leaves a sense of soreness over the abdomen. 6. Examination of the vomited matters. This is of the utmost importance and ought never to be neglected, and the same remark applies to materials discharged by regurgitation or eructation, or brought up by the stomach-pump. The chief points to be noticed are: *a.* The quantity rejected. *b.* The taste as perceived by the patient. *c.* Odor. *d.* General physical characters as to color, and as to the materials of which the vomited matters consist, whether of different kinds of food, unaltered or in various stages of digestion, decomposition, or fermentation; unusual substances introduced from without; blood or altered blood; gastric juice; watery fluid; mucus; biliary matters; fæces; morbid products, such as calculi, worms, hydatids, portions of growths, or pus. It is also desirable to observe whether the vomit is frothy or yeasty-looking. *e.* Chemical characters. The reaction should always be taken; and in certain cases it may be desirable to make a chemical analysis, in order to determine the presence of products of fermentation, gases, bile, sugar, urinary compounds, inorganic or organic poisons. Of course in any case of suspected poisoning a complete analysis must be performed. *f.* Microscopic characters. The chief materials to be looked for are blood-corpuscles, pus-cells, cancer-cells, ecchinococci, sarcinæ or

torulæ. The microscope is also of use in detecting certain poisonous substances. *Sarcinæ* are vegetable growths, and appear as little oblong rectangular bodies, in shape resembling minute wool-packs, being divided into four equal parts by cross lines which correspond to dissepiments, these being again subdivided by fainter lines, so that in all they make 64, each ultimate particle consisting of an elementary square cell. *Sarcinæ* are only found in acid vomit, which usually presents well-marked signs of having undergone fermentation, and they are most frequently observed in connection with pyloric obstruction.

DIAGNOSIS.—By attention to the particulars just considered, aided by the history of the case, and the other symptoms present, the cause of any vomiting may generally be satisfactorily made out. It is requisite, however, to point out the chief distinctions between *cerebral* and *gastric* vomiting. 1. Nausea usually precedes or attends the latter; but is often absent in the case of the former. 2. The accompanying symptoms in the one case point chiefly to the alimentary canal, especially to the stomach; in the other to the brain, head-symptoms being prominent. 3. The act of vomiting generally relieves any nausea, giddiness, or headache which may precede it, when it is gastric in origin; such is not the case with cerebral vomiting.

TREATMENT.—Vomiting occurs under such a variety of circumstances that little more can be done here than to indicate the general principles upon which its treatment should be conducted. 1. The cause must be sought out and removed if possible. Thus an emetic is not uncommonly one of the best remedies, in order to clear out the stomach of irritant matters. Any reflex excitement must also be subdued. Patients should be told to aid voluntarily in suppressing vomiting as much as they can; and warned against bringing it on by coughing or any such act. 2. Attention to diet is all-important. By withdrawing food altogether, or only giving very small quantities of cool liquids, especially milk with lime-water or soda-water, or brandy with weak beef tea or beef-juice, sickness may often be effectually stopped. It is particularly necessary to inquire into the feeding of children, as vomiting in these subjects is so commonly due merely to errors in this respect. 3. It may be useful to attend to certain general matters, such as position, rest, and free ventilation. Especially is this the case with regard to cerebral vomiting and sea-sickness, against which absolute rest in the horizontal posture, with plenty of fresh air, may afford some protection. Pressure by means of a girdle across the abdomen has been recommended to prevent sea-sickness. 4. The chief direct remedies for the relief of vomiting are the sucking of small lumps of ice; effervescent draughts with hydrocyanic acid, or the latter with mucilage; iced champagne or brandy with soda-water; opium, either in pill, as the tincture or liquor opii along with other remedies, or in an enema with starch; morphia in pill, by hypodermic injection, or sprinkled on

a blistered surface over the epigastrium; chloroform; creasote in drop doses in the form of pill; sulphurous acid, sulphite of soda, or hyposulphites, should the vomiting depend on vegetable growths, or carbolic acid under the same circumstances; *nux vomica* or minute doses of strychnia, the last-mentioned proving wonderfully efficacious in some instances after all other remedies have failed. Bismuth, magnesia, and carbonate of soda are also valuable under some conditions. Dr. Ringer recommends in many forms of vomiting drop doses of *vin. ipecac*, every hour or three times a day, according to circumstances; in others he finds arsenic useful. It is desirable to make all draughts as small and agreeable to the taste as possible.

External applications to the epigastrium are sometimes beneficial, especially sinapisms, blisters, cold by means of the ice-bag, and friction with chloroform or belladonna liniment.

IV. HÆMATEMESIS.

ETIOLOGY.—Blood may find its way into the stomach under a variety of circumstances. As a rule it comes from the vessels of this organ, being usually capillary in its origin, but sometimes due to the erosion of a large vessel; it may, however, be derived from other sources. The causes of hæmatemesis may be thus classified: 1. Traumatic, from external violence over the epigastrium. 2. Diseased conditions of the blood, especially in yellow fever. 3. Vicarious, particularly in connection with deficient menstruation. 4. Injury by foreign bodies or destructive chemical agents which have gained access into the stomach. 5. Abnormal conditions affecting the stomach itself. Thus hæmorrhage may be the result of violent vomiting and retching; congestion from any cause; inflammation; ulceration; cancer; or rarely atheroma of the vessels, embolism or thrombosis, or varicose veins. 6. Diseases of other organs and structures, especially those in the vicinity of the stomach. These chiefly act by inducing extreme mechanical congestion, which may follow any great obstruction of the portal circulation, but especially that due to cirrhosis of the liver, thrombosis of the portal vein or its branches, pressure upon the portal trunk or vena cava inferior; and long-continued cardiac and pulmonary affections. Acute atrophy of the liver is often attended with hæmatemesis, which is then partly due to the state of the blood. Splenic disease may cause it in both ways. Sometimes a neighboring disease, *e. g.*, cancer of the pancreas, destroys the coats of the stomach and thus opens its vessels. Occasionally an abdominal or thoracic aneurism bursts into this organ. It is stated that an omental hernia may drag it downwards, and thus lacerate the mucous membrane. 7. It must not be forgotten that blood may be swallowed, either coming from the œsophagus, mouth, throat, nose, or respiratory organs. The blood of animals, also, is actually

purposely swallowed sometimes, either by hysterical girls or for purposes of deception.

SYMPTOMS.—Hæmorrhage into the stomach may not be attended with any external indications, either because the blood is poured out so abundantly as to kill instantly ; or, on the other hand, because it is in very small quantity. In the majority of cases, but not always, there is either some obvious cause of the hæmorrhage ; or it is preceded by symptoms referable to the stomach, or by signs of organic disease in its vicinity. Usually the blood is rejected, either by a mere act of regurgitation, or in most cases by more or less violent vomiting, though it must be remembered that this act may be the cause of the bleeding. The quantity of blood discharged necessarily varies much, and it is generally more or less mixed with food and other materials. Its characters are in the majority of cases very distinctive, it being non-aerated ; brown or black in color ; grumous, often resembling “coffee-grounds,” soot, or tar ; and acid in reaction. Should the blood be coagulated, the clots are broken up, irregular, firm, and heavy. On microscopic examination the red corpuscles are seen to be much altered in shape or destroyed, and pigment granules are abundant. Most of these characters depend upon the action of the gastric juice on the blood. If the blood is discharged immediately or soon after its escape into the stomach, it may be quite bright and unaltered, or only slightly changed. Commonly some of it passes on into the bowels, giving rise to tarry stools. The general symptoms indicating loss of blood will of course be present in proportion to the extent of the hæmorrhage.

DIAGNOSIS.—The most important matter is to distinguish between hæmatemesis and hæmoptysis, which can usually be done by a consideration of the following points : 1. The age of the patient, hæmatemesis being more frequent later in life than hæmoptysis, except in the case of young women who are the subjects of perforating ulcer. 2. The previous and existing symptoms, as indicating some condition likely to give rise to one or the other ; and also the symptoms immediately premonitory to the attack, in the one case pointing generally to the stomach, in the other to the lungs. 3. The mode of discharge of the blood, whether by coughing or vomiting. It must be remembered, however, that vomiting may be excited by the cough in hæmoptysis ; or some of the blood may be swallowed and afterwards rejected from the stomach. 4. The characters of the blood, as already described, with reference to color, aeration, general aspect, reaction, and microscopic appearances. 5. In hæmoptysis some blood usually continues to be discharged in the expectoration for a certain time after the main bulk has been expelled ; which is not the case in hæmatemesis. 6. Along with hæmatemesis altered blood is usually seen in the stools. 7. Careful physical examination will often reveal some organic cause likely to give rise to pulmonary or gastric hæmorrhage ; and in connection with the former

there may be *râles* indicating the presence of blood in the bronchial tubes.

- As regards the cause of hæmatemesis, this can only be made out by a thorough consideration of the case in all its details. Blood coming from above may be usually detected by local examination of the throat and nose. It is necessary to warn against mistaking the color due to altered bile or iron for that of blood.

TREATMENT.—The principles of treatment are the same as for other hæmorrhages. In addition to bodily rest, the stomach must be kept in a state of absolute repose in severe cases, nutriment being administered only by enema; in less dangerous cases very small quantities of cool liquids being alone permitted. The patient should swallow small lumps of ice at intervals. The most efficient medicines are gallic acid or acetate of lead in full doses combined with opium; or oil of turpentine. Ice may be applied carefully over the epigastrium. It is very important to check any violent efforts at vomiting by means of hydrocyanic acid with mucilage; morphia internally or by subcutaneous injection; or an enema containing tincture of opium; at the same time a sinapism being applied over the epigastrium. In cases of capillary hæmorrhage dependent on congestion from portal obstruction, a saline purgative is useful, or an aperient enema. Should stimulants be required on account of collapse, they are best administered by injection. Vicarious hæmorrhage must be treated according to the ordinary principles.

V. DYSPEPSIA—INDIGESTION.

ETIOLOGY.—Difficulty and imperfection in the digestive process arise under a variety of circumstances, either in connection with the stomach, the intestines, or both; and affecting all articles of diet alike, or only special elements of food. In ordinary language *dyspepsia* or *indigestion* signifies a group of symptoms depending upon interference with the gastric digestion, and this will at present be alone considered. In many instances it is merely due to functional disturbance, or at all events no obvious organic disease can be detected, and it is to this class of cases that the terms are often limited; the same symptoms, however, are commonly associated with different forms of organic mischief, and in the subsequent remarks on this subject it will be impossible to avoid alluding to these.

The causes of dyspepsia in general may be grouped under certain heads, viz.: 1. Disorders connected with the diet, viz., excessive eating; too rapid eating; insufficient mastication and ensalivation, this being especially associated with the habit of "bolting" food, or being due to absence or irregularity of teeth, particularly in old people; irregularity in meals, or their being taken too frequently or the reverse; and improper quality of food. The last may depend upon the nature

of the food itself; the manner in which it is cooked; or upon its having undergone fermentation or decomposition. Liquids not uncommonly cause indigestion, and special mention must be made of the habit of drinking large quantities of cold water or other drink with meals, by which the gastric juice is much diluted; of excessive indulgence in tea, or sometimes coffee; and abuse of alcohol, particularly when spirits are taken at frequent intervals, strong and undiluted. Injudicious use of sharp condiments with food sometimes originates dyspepsia. Idiosyncrasy causes some individuals to suffer after special articles of diet which are usually easily digestible, such as milk or eggs. 2. Alterations in the gastric juice. This secretion may be in excess; deficient, even to complete suppression; or of morbid quality. The principal changes in quality are excess of acid; deficiency of acid, pepsin, or both; admixture with abundant mucus secreted by the stomach, which may even render the gastric juice alkaline; and the addition of abnormal ingredients. These alterations result from: *a.* Organic affections of the stomach, especially mechanical congestion; inflammation; degeneration and atrophy of the secreting glands; degeneration of the vessels; ulceration; and cancer. *b.* Morbid conditions of the blood, as in renal disease, diabetes, pyrexial conditions, gout, anæmia. *c.* General want of tone and debility. *d.* Nervous disturbance. 3. Changes affecting the movements of the stomach. The expulsive power of the stomach may be interfered with, in consequence of want of muscular or nervous tone, dilatation, or pyloric obstruction; or the movements are irregular; or the food passes out too soon, before it is properly digested, either in consequence of undue excitability of the stomach, or of imperfection in the pyloric valve. It is by influencing the secretory and motor functions of the stomach that many of the ordinary causes aid in inducing dyspepsia, such as sedentary habits; undue exertion either just before or after a meal; habitual constipation; abuse of narcotics, tobacco, tea, or alcohol; excessive study, emotional disturbance, or any form of mental shock; venereal excesses. Most important is it to bear in mind also that dyspeptic symptoms may be entirely due to disease of some other organ than the stomach; and in any case not yielding to treatment, the condition of the principal organs should be ascertained.

SYMPTOMS.—In the first instance it will be well to give a general outline of the clinical phenomena which are, in different combinations, observed in cases of dyspepsia; and then to indicate the characters of the main varieties.

Uncomfortable or painful sensations are experienced over the epigastrium, chiefly after meals, either due to the state of the stomach itself, or to its being irritated or distended by the materials formed as the result of the imperfect digestion. Not uncommonly these are also complained of over the front of the chest or between the shoulders.

There is no tenderness as a rule. In the great majority of cases appetite is impaired or lost; some patients, however, have an inclination for food, but cannot take any or only certain articles on account of the discomfort which it produces, or they are soon satisfied. Thirst is generally absent, but may be a prominent symptom. From the decomposition and fermentation of food result flatulent distension, with a sense of fulness and weight in the epigastrium; acidity; heartburn; and eructations. It is very important to ascertain the characters of the eructations. They consist of gases, various liquids, and undigested food. The gases are either tasteless and odorless, resulting from fermentation; or have some peculiar smell and taste, of which the chief are those resembling fish or rotten eggs, both being associated with deficiency or arrest of secretion, and the last being due to decomposition of food and the formation of hydric sulphide. The principal liquid eructations are the watery fluid of pyrosis; and matters having an acid, rancid, or bitter taste. Acid eructations indicate either that excess of gastric juice is formed; or more commonly that the contents of the stomach have undergone acid fermentation; butyric acid imparts the rancid characters. Bitter eructations probably contain bile. Nausea is felt in many cases, but vomiting is not a frequent symptom, though some patients endeavor to excite it after taking food, in order to relieve their discomfort. The bowels are usually disturbed in their functions, as indicated by constipation, or in some instances by diarrhœa; colicky pains; flatulence and borborygmi; and the passage of fetid gas. The tongue, mouth, and throat are generally in an abnormal state, but they present different appearances in the different varieties of indigestion. The breath is also frequently offensive.

The general and other symptoms previously described as being associated with disorders of the alimentary canal are present in variable combinations.

VARIETIES.—I. ACUTE DYSPEPSIA.—This may come on in an individual habitually quite free from dyspeptic symptoms; or be merely an exacerbation of a previously existing morbid state. It is difficult to determine precisely what the morbid condition is in many cases of acute dyspepsia, but unquestionably in a good number of them there is gastric catarrh; while others are merely instances of migraine, or so-called "sick headache." Some cases are, however, true examples of simple dyspepsia, arising either from some error in diet; or as the result of interference with the secretion of gastric juice, owing to nervous disturbance from emotion, over-exertion, and other causes.

The symptoms differ much in intensity and duration, but are liable to be particularly severe in children. They come on shortly after a meal. Usually in about three or four hours, and are of the following nature: uneasiness or pain in the epigastrium, with heaviness and fulness, or sometimes cramplike sensations, but no tenderness;

complete distaste for food; thirst; nausea or vomiting of undigested food and other matters, such as mucus, acids, or bile, which affords relief; eructations of gases, either tasteless and odorless or like rotten eggs, as well as of acids; heartburn; a large and moist tongue covered with a thick white or yellow fur, and sometimes presenting enlarged and red papillæ; disagreeable taste and breath; constipation usually, but occasionally diarrhœa with colicky pains. The general symptoms are usually very pronounced, and there is not uncommonly a sense of extreme illness and depression, with a certain degree of pyrexia, the skin being dry; herpes about the face or general urticaria may break out. The urine is generally concentrated and deposits lithates; occasionally there is slight albuminuria. In infants there may be high fever or convulsions. Probably many of the cases of so-called "gastric remittent fever" in these subjects are merely instances of acute dyspepsia with febrile symptoms assuming a remittent type.

The *treatment* of this complaint is similar to that of the slighter cases of gastric catarrh, which will be presently described. It is important to remove speedily all irritant matters by means of emetics, aperients, or enemata.

II. CHRONIC DYSPEPSIA.—1. ATONIC.—Most of the ordinary cases of dyspepsia belong to this variety, being associated with general debility; anæmia; want of tone in the coats of the stomach; or sometimes degeneration of the peptic glands. The gastric juice is deficient and muscular activity impaired. The sensations in the epigastrium are mainly those of weight, fulness, and discomfort after food, without actual pain or tenderness, pressure often affording relief. Not uncommonly there is in the intervals a constant sense of sinking in the epigastrium. Occasionally œsophagismus is experienced. There is a disinclination for food, and not unfrequently for drink. Digestion is much delayed, and a quantity of foul gas is formed, as well as acids and rancid matters, there being hence much flatulence, with various eructations. The tongue is large and marked with the teeth, pale, flabby, moist, and usually more or less furred. The mouth and throat are also often pallid, flabby, and relaxed; and the breath is very disagreeable. As a rule there is habitual and obstinate constipation, the stools being firm, pale, deficient in bile, and offensive. The general symptoms are well-marked usually, the pulse being feeble, wanting in tone, and easily hurried; the skin cool, soft, and clammy, with a tendency to coldness of the feet and hands; and the urine often abundant and watery. The nervous symptoms incline chiefly to languor, apathy, and indisposition for any effort. Oppression across the chest, shortness of breath, cough, and palpitation, are often complained of.

2. IRRITATIVE.—Probably in the form of dyspepsia thus named, a condition of chronic gastritis is present to a greater or less degree. Actual pain or a sense of burning is experienced in the epigastrium,

increased by food, and generally accompanied with a little tenderness. Heartburn and acidity are also common symptoms. Appetite is impaired, but thirst is usually felt, especially for cool drinks. Occasionally vomiting takes place. Eructations are frequent, but are not fetid as a rule. The tongue tends to be contracted and red, especially at the tip and edges, with enlarged papillæ; it may be furred or clean. The throat also is frequently in an irritable condition, being reddened and granular, or sometimes presenting follicular ulcers. Though constipation is the rule, from time to time diarrhœa with colicky pains is apt to set in. The skin tends to be hot and dry, the palms and soles having a burning sensation; and sometimes a cutaneous eruption breaks out. The pulse is frequent. The urine is often concentrated and deficient in quantity, depositing lithates on standing. The nervous disturbance is chiefly in the direction of irritability and petulance, with restlessness. There may be considerable emaciation.

3. *NERVOUS*.—A variety of dyspepsia has been described by this term, in which the prominent symptom is pain after food, supposed to be associated with hypersecretion, and observed chiefly in young women. It seems to be merely a form of gastralgia, and may exist alone or associated with other kinds of dyspepsia.

4. One form of indigestion deserves special notice, which is by no means uncommonly met with, especially in out-patient hospital practice, in which there is an excellent appetite, and no particularly unpleasant sensations are felt after food, but almost as soon as it is taken it seems to pass out of the stomach, owing to an irritable condition of this organ; then rapidly traverses the intestines, giving rise to borborygmi and colicky pains; and is speedily followed by diarrhœa, the stools consisting chiefly of undigested food. Hence there is a constant craving for food, and a sense of considerable exhaustion or prostration is often experienced after the passage of a stool. In some instances this course of events only occurs the first thing in the morning; in others it follows every meal, and may thus cause serious loss of flesh. In some cases under my care the symptoms have been apparently due to the habit of excessive smoking, or to over-indulgence in hot tea.

CHAPTER XXXIII.

ACUTE GASTRIC CATARRH—ACUTE GASTRITIS.

ETIOLOGY.—1. The ordinary cause of acute inflammation of the stomach is some direct irritation of its mucous surface, mechanical or chemical, and produced by food or drink, foreign bodies, or poisons.

Food may excite inflammation in any of the ways mentioned under acute dyspepsia. Certain irritants require special notice, viz., very hot or cold substances; alcoholic liquids, either taken in excess or insufficiently diluted; sharp condiments; tartar emetic and arsenic. It must not be forgotten that the last two have been frequently administered for poisoning purposes, and arsenic may be inhaled from certain green papers used for papering rooms. 2. More or less gastric catarrh is commonly present in the course of the various exanthemata, cholera, and yellow fever; and sometimes in diphtheria, pneumonia, puerperal fever, gout, rheumatism, and other febrile diseases. 3. The membrane lining the stomach may be affected, along with other mucous surfaces, as the result of "taking cold." 4. Drinking a large quantity of cold water while the body is heated has been mentioned as a cause of gastric catarrh. 5. It is stated to occur occasionally as an epidemic, attended with pyrexia. 6. Gastritis arises in consequence of starvation, but is then probably originated indirectly. As regards *predisposing causes*, it may be stated that children, elderly or feeble persons, and those who habitually suffer from a disordered stomach, are more liable to gastritis from errors in diet and other slight causes.

ANATOMICAL CHARACTERS.—Hyperæmia of the membrane has been observed during life in cases of gastritis where a fistulous opening into the stomach existed, but it may completely disappear after death. The redness is punctiform or capillary, and usually in isolated patches; in cases of irritant poisoning, however, intense redness may be seen over the entire surface, though generally more marked on the top of the rugæ. Small extravasations are not uncommon. There is the usual cloudiness or opacity, with swelling and thickening of the membrane, and diminution in consistence. Superficial erosions or ulcerations and follicular ulcers are visible in many cases. In exceptional instances, when the inflammation is very intense, sloughs form, or suppuration is set up in the submucous tissue. Very rarely croupous or diphtheritic deposits have been observed. The secreting structures undergo important changes. The cells and nuclei of the tubuli become enlarged and multiply, while numerous granules and fat-globules form, so that the tubuli are distended. The solitary and lenticular glands are much increased in size. Gastric juice is not properly secreted, but the surface is covered with a thick, ropy mucus, alkaline in reaction, and containing a large number of young cells. Between the glands, also, there is a multiplication of cells, the lymphatic tissue being increased.

It will be readily understood that the appearances vary greatly according to the intensity and cause of the inflammation; when this is the result of poisoning it often presents special characters, and deposits of the poisonous substance may be observed, or actual destruction of the coats of the stomach may take place. For a description of these appearances reference must be made to toxicological works.

SYMPTOMS.—The circumstances just alluded to will also necessarily influence the intensity of the symptoms, these being *local* and *general*.

Local.—Pain over the epigastrium is almost invariable, and may be very intense. In characters it is often hot and burning; or it shoots in different directions, especially towards the back. In some cases there is merely a sense of aching and soreness, or uneasiness and weight. These sensations are increased by food, the act of coughing, or a deep inspiration. Vomiting often relieves them, but in some cases this act aggravates the suffering, especially if accompanied with violent retching. When the pain is very intense, there may be spasm of the abdominal muscles. Tenderness is always present, even when pain is not complained of spontaneously. Nausea, vomiting, and retching are prominent symptoms, anything that is swallowed being usually rejected at once. The vomited matters contain much mucus, saliva, often bile, and not uncommonly a little blood or “coffee-grounds” material. There is complete anorexia, with urgent thirst, particularly for cool drinks. The tongue is frequently small, red, and irritable, especially at the tip and margins; it may be furred in the centre, smooth, with a tendency to dryness; or large, moist, covered with a white fur, the papillæ being enlarged. The mouth is slimy, and an unpleasant taste is experienced. Constipation or diarrhœa may be present, according to the state of the intestines. The lips are sometimes the seat of herpes.

General.—In some forms of gastritis premonitory symptoms are observed, such as chills or slight rigors, feverishness, and general malaise. During the attack pyrexia is frequently present, though seldom to a marked degree, except in children, with restlessness, headache, nervous depression, and sleeplessness. In severe cases, especially when the inflammation is the result of poisoning, there is often great prostration and collapse, with a cold and clammy skin, pinched and anxious features, and a very rapid, weak, and small pulse. Hiccough is sometimes a most troublesome symptom, and the breathing may be much hurried.

DIAGNOSIS.—The symptoms above described, if present to any marked degree, are quite characteristic of gastritis; but in mild cases, or when gastric catarrh occurs as a complication of fevers, it may be difficult to diagnose this affection positively. The tongue often gives useful indications under these circumstances. When there is much pyrexia, constituting the so-called “gastric fever,” typhoid fever may be simulated at first.

PROGNOSIS.—Generally this is favorable, except when the gastritis is the result of poisoning, or when it assumes a severe character, and attacks weak persons, very old or young individuals, or those suffering from acute febrile diseases. In some cases the complaint tends to become chronic.

TREATMENT.—1. If there is anything in the stomach causing irrita-

tion, the first thing to be done is to get rid of this by means of an emetic of sulphate of zinc, mustard, or ipecacuanha, with plenty of lukewarm water; or by the stomach-pump, if necessary. A purgative at the outset is often useful, such as a dose of calomel followed by a black draught, castor oil, or a draught containing sulphate and carbonate of magnesia; in some cases an enema may be advantageously employed. It is decidedly objectionable to administer purgatives repeatedly, but, if necessary, an enema may be given from time to time.

2. The patient should be kept quiet in bed, and it is most important to allow the stomach to remain in a state of rest, either complete or partial, according to the severity of the disease. In dangerous cases no food should be taken by the mouth, but nutrient enemata administered instead. If food is permitted, it must be entirely of a liquid character, or only thickened with some farinaceous substance, and given in small quantities at regular intervals. Milk diluted with lime-water or soda-water, or mixed with a little arrowroot or corn-flour, weak beef tea, mutton- or chicken-broth, are the most suitable articles of diet. The patient must be prevented from drinking large quantities of water, which is usually much craved for, but may suck small lumps of ice at frequent intervals, and this gives much relief. As a rule stimulants are not required, but sometimes brandy in small doses, well diluted or mixed with soda-water, milk, or beef tea, seems to be decidedly beneficial; or a little champagne with soda-water. Should there be much prostration, considerable quantities of alcoholic stimulants may be called for, and if the stomach will not bear them they must be administered by enema.

3. The prominent symptoms are most effectually alleviated by the administration of antacids and sedatives. Among the most serviceable remedies may be mentioned a combination of bismuth with hydrocyanic acid and opium; iced effervescent draughts containing carbonate of ammonia, potash, or soda with hydrocyanic acid and tincture of cardamoms; solid opium, gr. $\frac{1}{2}$ —ij, or, better still, morphia, gr. $\frac{1}{8}$ — $\frac{1}{4}$; hydrocyanic acid (℞ iij—v), with a little mucilage; magnesia and the alkalies, alone or in combination with the other remedies. Either of these should be given at intervals of from two to four hours, according to circumstances, and it is desirable to make the quantity of the medicine as small as possible. The alternation of effervescents with an opium or morphia pill is frequently attended with the best results. In treating children of course due caution must be exercised in employing the powerful drugs mentioned.

4. *Local Treatment.*—In cases of severe gastritis it might be advisable to apply a few leeches to the epigastrium, but venesection is never required. The constant application of heat and moisture over the abdomen by means of poultices, fomentations, or spongiopiline, is highly beneficial. Cold is employed by some practitioners. Sinapisms

are sometimes of use, but more severe forms of counter-irritation are of doubtful efficacy. When gastritis arises from retrocedent gout, an attempt should be made to excite inflammation in the joints.

5. Much care is needed during convalescence as regards diet, hygienic management, and medicinal treatment. Various remedies employed in the more chronic complaints, which will be hereafter considered, are useful if given with care, such as the vegetable bitters, alkalies, acids, pepsin, and preparations of iron. The state of the bowels must be attended to, and mild purgatives given if required. Vichy and Seltzer waters are often beneficial.

CHAPTER XXXIV.

CHRONIC DISEASES OF THE STOMACH.

I. CHRONIC GASTRITIS—CHRONIC GASTRIC CATARRH.

ETIOLOGY.—In its more or less chronic form gastric catarrh is met with: 1. Occasionally as the remains of an acute attack. 2. As the result of constant or repeated irritation of the stomach, particularly by indigestible food, tea, alcohol, purgatives, stimulant and bitter medicines, hot condiments, and arsenic. 3. In connection with chronic organic diseases of the stomach, especially cancer, ulceration, and albuminoid disease. 4. From interference with the portal circulation, which leads to persistent mechanical congestion of the stomach. 5. Associated with constitutional disorders, particularly phthisis, renal disease, gout, syphilis, or any low general condition of the system.

ANATOMICAL CHARACTERS.—The color of the mucous lining is changed, there being increased vascularity, and the vessels may be permanently distended; frequently, especially if there has been mechanical congestion as well, portions of the surface are seen to be gray, slate-colored, or almost black from altered blood-pigment. Small hæmorrhagic erosions are not uncommon. The surface is often covered with a thick tenacious mucus. One of the most important changes is a thickening of the membrane, accompanied with increased firmness and toughness, sometimes so marked that it has a leathery feel, although there may be at the same time slight superficial softening. More or less opacity is also observed, some spots appearing quite opaque and white from fatty degeneration. Mammillation is a common appearance near the pylorus. The intimate changes which occur have been described by Wilson Fox, Fenwick, Handfield Jones, and others, as an increase in the interstitial tissue, including the lymphatic elements; distension of the solitary

glands; alterations in the gland structures here and there, in the way of fatty degeneration and destruction of their epithelium, thickening of their membrane, contraction and puckering, formation of minute cysts, or atrophy; sometimes fatty degeneration of the entire membrane in spots, including the small vessels. The mammillation may be due to the enlarged glands; or to contraction of the muscular fibres which surround them.

SYMPTOMS.—The symptoms referable to the alimentary canal which are most characteristic of chronic gastritis are considerable uneasiness over the stomach, amounting in some cases to actual pain, though never severe, generally increased soon after meals, especially after taking hot or spiced articles; a certain degree of tenderness; a sense of heat and burning, sometimes extending over the chest; frequent heartburn, with acidity, and acid or gaseous eructations; impaired appetite, the patient being soon satisfied, though there may be a feeling of emptiness and longing for food; thirst, especially for cool drinks, often particularly marked between meals and in the evenings; a small, bright-red, raw-looking, and sore tongue, with enlarged and red papillæ, or the last condition alone, there being usually more or less fur as well, though in some cases the tongue seems abnormally clean; an irritable or catarrhal condition of the lips, mouth, and throat, sometimes with aphthæ or follicular ulceration; hot and disagreeable breath; intestinal disturbances, either in the way of constipation with pale and dry stools, or of diarrhœa with lenteric stools, flatulence, and colicky pains. There is often a feeling of sickness, but actual vomiting is only common in certain forms of gastric catarrh, viz., when it is associated with chronic alcoholism, renal disease, or portal congestion, sickness being then frequently a prominent symptom in the mornings and after meals. In some cases a large amount of alkaline mucus is brought up, when the affection is termed *gastrorrhœa*.

The general system suffers more or less as a rule, there being the various nervous and reflex symptoms previously described, often accompanied with loss of flesh and debility; sallowness or slight jaundice; a little pyrexia, especially in the evenings and after food or stimulants, with a dry and harsh skin, a sense of burning in the palms and soles, and flushing of the face. The urine is frequently disordered, depositing urates abundantly, or in some cases phosphates or oxalates. Cutaneous eruptions are not uncommon. Sometimes signs of premature decay are evident.

II. ULCER OF THE STOMACH.

Some writers describe all ulcerations of the stomach under one group; others distinguish two chief forms, viz., the *perforating*, characterized by its tendency to perforation; and the *chronic*, which is attended with much thickening of tissues.

ETIOLOGY.—On the whole females are more subject to gastric ulcer than males. It is most common between 18 and 25 or 30 years of age; and in advanced life. The perforating ulcer is most frequent in young females; the chronic in old males. Among the immediate causes of gastric ulceration have been mentioned intemperance, bad living, mental anxiety, tuberculosis, various lowering diseases, disorders of menstruation, suppression of hæmorrhoidal flux, pregnancy, and healing of cutaneous ulcers. Much doubt exists, however, on this matter.

ANATOMICAL CHARACTERS.—The *perforating ulcer* or, according to some, the *early stage of ulceration*, may be seen in various stages of destruction of the coats of the stomach, beginning with the mucous membrane and extending towards the peritoneum. Its edges are even and clean cut, as if punched out, without any thickening, and as each subsequent coat is destroyed over a smaller area than that above it, the ulcer has a somewhat conical shape, the apex being next the peritoneum, and the margin of each layer being well defined. The floor is smooth, but may be sloughy or covered with extravasated blood.

After the *chronic ulcer* has existed for some time, its margins and floor become greatly thickened and indurated by the formation of a nucleated and granular substance, which subsequently develops into imperfect fibrous tissue. The different layers become matted together over a variable extent, but the ulcer remains distinctly conical or funnel-shaped, the mucous membrane being inverted. Granulations are sometimes seen on its surface. It is important to notice that in this condition of the ulcer firm adhesions tend to form between the stomach and neighboring organs, by which the evils of perforation are prevented.

The superficial form of gastric ulcer is usually circular or oval at first, but it may become irregular from extension or from the coalescence of two or more. The size generally varies from $\frac{1}{4}$ inch to 1 or $1\frac{1}{2}$ inch in diameter, but the length may reach five or six inches. Usually there is only one ulcer, but two or more are sometimes found, or cicatrices of former ulcers may be observed. The most frequent seats of ulceration are the posterior surface, the neighborhood of the smaller curvature, and near the pylorus; it is rare on the anterior surface, near the greater curvature, or at the cardiac end. Chronic ulcer is most frequent in the vicinity of the pylorus.

The mucous membrane around the ulcer may be healthy, or presents signs of hæmorrhages and extravasations, polypoid vegetations, acute or chronic catarrh.

Cicatrization frequently occurs, generally by granulation, and the cicatrix may either be smooth or puckered, or give rise to much thickening, contraction, and alteration in the form of the stomach, leading to stricture, especially at the pyloric end, with various distorted shapes. Sometimes an ulcer does not completely cicatrize; or it heals at one spot and extends at another.

Perforation is very liable to happen if there is no thickening or adhesion, especially when the ulcer is in a position where it is subject to much disturbance by movement and distension of the stomach, and where adhesions cannot easily form, as in the anterior wall and near the smaller curvature. The peritoneum forms a small slough, and then gives way by a little sharply defined or slightly torn opening. If adhesions have formed, the coats may be destroyed completely, and ultimately even considerable portions of contiguous organs. In some cases the thickened peritoneum is distended in the form of a pouch.

PATHOLOGY.—Gastric ulcer is considered by most authorities to originate in an interference with the supply of blood to a portion of the mucous membrane, the vitality of which is thus impaired, so that it is acted upon by the gastric juice and destroyed, the deeper tissues being subsequently attacked in the same way. This may result from extensive extravasation into the tissues of the stomach; embolism; degeneration or narrowing of the arteries; or rarely submucous supuration. Some pathologists regard all ulcers as being the result of inflammation.

SYMPTOMS.—Occasionally gastric ulcer is unattended with any characteristic symptoms, until revealed by some serious event, such as perforation or the opening of a large vessel. In many instances they are for a time but ill-defined and obscure, especially in the chronic form of ulceration. The clinical phenomena which are suggestive of ulcer may be thus summarized: Severe localized pain in the epigastrium, of aching, gnawing, or burning character, or attended with a feeling of sickness and prostration, persistent but increased after food, especially after certain articles, such as hot tea; local tenderness on pressure; vomiting, particularly after taking anything, not attended with much nausea or retching as a rule, and generally affording relief to the pain, the vomited matters sometimes containing *sarcinæ ventriculi*, or fragments of the stomach-tissues; hæmatemesis, either due to capillary rupture or of the opening of a large vessel, and generally followed by *melæna*; various dyspeptic symptoms, such as flatulence, eructations, pyrosis, deranged appetite, and constipation or occasional diarrhœa; with more or less general wasting and debility, which may be accompanied with a dull, earthy, cachectic aspect, or in young females with a marked anæmic or chlorotic tint; the menstrual functions being also usually much disturbed in these subjects.

There are some points of importance which require comment. The exact site of the pain will vary with that of the ulcer, but it is most common a little to the right of the epigastrium; if the ulcer is on the posterior surface it may be referred to the back on one side of the spine. Movement and posture often influence the degree of suffering, and it is frequently aggravated by mental emotion, or in females during the menstrual periods. In the chronic form pressure not uncommonly gives

marked relief, and hence patients voluntarily press against the epigastrium. Occasionally food also gives ease instead of increasing the pain. Vomiting is chiefly observed when an orifice or its vicinity is affected, especially the pyloric. The interval which elapses between the taking of food and any sickness or aggravation of suffering will often indicate the situation of the ulcer: thus, if it is near the cardiac opening these effects are produced immediately; if about the pylorus they only follow after some time. In some instances the pyloric orifice is permanently obstructed, and the stomach becomes consequently dilated, the signs of which will be presently indicated. No distinct tumor can ever be felt, but occasionally, when there is much thickening and induration about the pylorus, this can be made out by careful manipulation. The tongue is often abnormal, but has no special characters. Salivation is said to occur sometimes, the saliva being deficient in sulphocyanides.

The degree of the general symptoms will depend mainly on the amount of pain, interference with digestion and nutrition, and hæmorrhage. In exceptional instances of perforating ulcer pyrexia has been noticed.

The course and duration of cases of gastric ulcer are very variable. As a rule they are chronic, but occasionally the perforating variety appears to be rather acute in its progress. Many cases terminate in cicatrization and recovery; but death is also a common event, occurring either suddenly or rapidly from perforation or hæmorrhage, or gradually from asthenia.

III. CANCER OF THE STOMACH.

ETIOLOGY.—Among general predisposing causes of gastric cancer age is the most important. The majority of cases occur between 50 and 60, but the complaint may be met with from 30 to 70, and, exceptionally, even beyond these extremes. The male sex; hereditary tendency; a high social position; and mental anxiety are also believed to predispose. As local causes have been mentioned long-continued pressure over the epigastrium; injury; and the repeated action of irritants upon the stomach, such as hot spices or strong spirits.

ANATOMICAL CHARACTERS.—All forms of cancer are met with in the stomach, but scirrhus is by far the most common. It is here, however, that the colloid variety is usually observed. The pyloric orifice and its vicinity is the part of the stomach generally involved, but the cardiac end, curvatures, fundus, or body may be attacked. The cancer may be very limited in extent, especially scirrhus; or widely spread, implicating a great portion of the walls, which is especially the case with colloid, and when the body of the stomach is affected. In some cases it passes from the stomach to the œsophagus, but shows no tendency to invade the duodenum. The submucous tissue is usually the primary seat of

the deposit, and it subsequently involves the deeper coats and partially the mucous membrane. Colloid, however, according to Dr. W. Fox, seems to begin in the glandular structures. In most cases the morbid growth infiltrates the coats, but encephaloid cancer is prone to form nodular masses in the submucous tissue.

The actual characters of the cancerous part will necessarily vary with the nature and amount of deposit; in most instances it will be found hard, dense, thickened, contracted, and whitish on section, but each variety presents its own peculiar characters. Not unfrequently the mucous membrane becomes destroyed, and an ulcer forms, but there may be extensive cancer without any ulceration. The ulcer has thick ragged margins and an uneven floor, which presents cancerous masses. Adhesions often form with other organs, which may become involved by extension; or occasionally perforation takes place into hollow viscera or other parts.

The seat of the cancer influences much the shape and size of the stomach and the condition of its walls. When it involves the pylorus the organ becomes much dilated and its walls hypertrophied. On the other hand it is contracted, shrunken, and small when the cardiac orifice is affected. If the middle of the body alone is implicated, the cavity is greatly constricted at this part, so that the stomach assumes an hour-glass form. Cancer along the curvatures distorts the stomach in various ways by its contraction, often drawing the orifices near together. In some instances the organ is displaced considerably, owing to a mass at the pyloric end having fallen by its own weight and become adherent in some abnormal position. Such a mass may press on various structures and thus lead to other morbid conditions, *e. g.*, on the portal vein, causing ascites.

Acute or chronic gastritis and glandular degeneration are generally observed to a greater or less extent.

Cancer of the stomach is almost always primary, but it tends to involve other abdominal organs and structures, either by extension or as secondary deposits, the latter being particularly common in the liver.

SYMPTOMS.—For some time, and in some cases even to the last, the symptoms are merely those of dyspepsia, with wasting; or the disease may be entirely latent. As a rule, however, there are prominent *local* and *general* symptoms.

Local.—Pain is generally present in some part of the epigastrium, varying with the seat of the cancer, and though at first amounting merely to a sense of weight and uneasiness, it usually becomes very intense. It may be continuous or intermittent, and is often paroxysmally increased. Food aggravates it as a rule, but not so distinctly as in gastric ulcer, and it may be relieved by food. In character it is frequently described as aching, burning, or gnawing, as well as lancinating, shooting towards the hypochondria, back, or shoulders.

Tenderness is almost invariable, with a feeling of soreness, even when there is no spontaneous pain, the slightest touch being sometimes unbearable. This may be associated with some evident tumor or thickening.

Nausea and vomiting are rarely altogether absent, usually becoming more frequent and distressing as the case progresses. Vomiting is particularly observed if the orifices are involved, or if there is ulceration, and the time of its occurrence after food varies according to the seat of cancer, in the same manner as has been described when speaking of ulceration. The rejected matters not uncommonly contain numerous *sarcinæ ventriculi* and *torulæ*, as well as occasionally cancerous elements; when there is ulceration they may be very offensive.

Hæmatemesis is a very frequent and early symptom, but usually to a small amount. Large hæmorrhages are stated only to occur in the later stages, and not to be so common as in connection with ulcer, but the former statement is certainly not always true, according to my experience. Melæna is often observed at the same time, or even independently of hæmatemesis.

Appetite varies, and the tongue has no constant characters. Among other frequent symptoms are flatulence; gaseous eructations, at first odorless, afterwards often fetid; acidity; gastrorrhœa; obstinate constipation; and hiccough.

Physical examination may reveal one or more of the following conditions, and it should in all suspected cases be carefully and repeatedly made, especially when the stomach is empty. 1. A sensation of fulness and resistance over the epigastrium, perhaps not uniform, detected by manipulation and percussion, the sound produced by the latter being somewhat dull and muffled. This indicates extensive infiltration of the walls. 2. A distinct tumor, especially in connection with scirrhus of the pylorus. Its site is usually the right hypochondrium or epigastrium, but it may be felt in the iliac fossa owing to displacement, or in females near the umbilicus. The tumor is small, circumscribed, dense, hard, and irregular. Not usually movable by manipulation, it sometimes alters its position with change of posture and with varying degrees of distension of the stomach. There is dulness on percussion over the tumor. Aortic pulsation may be transmitted through it. It is said that a tumor may disappear completely by sloughing or ulceration. 3. Dilatation of the stomach, due to pyloric obstruction. 4. Retraction of the abdomen, which may become concave, and when this condition is present a tumor can be more easily detected, and may even be visible. On the other hand in exceptional instances a pyloric tumor presses on the portal vein and thus causes ascites.

General.—The constitutional symptoms are as a rule very pronounced, viz., early and rapidly-progressing emaciation and debility, ultimately often becoming extreme; signs of the cancerous cachexia, the skin

being dry and harsh, with a dirty, sallow, or earthy hue, and the features sunken and pinched; marked anæmia, especially if much blood has been lost, with a tendency to œdema of the legs, or sometimes to thrombosis; great weakness of the heart and pulse; lowness of spirits, with a melancholic and anxious expression, or irritability and moroseness; and disturbed sleep. Occasionally jaundice is observed, owing to pressure on the common duct. In the later stages the temperature is now and then a little elevated, but pyrexia is absent as a rule.

The course and duration are subject to some variations. Generally the progress is continuous and rapid; sometimes there are slight or even marked remissions in the symptoms, but these seldom last for any length of time. Cases rarely extend beyond two years from the first appearance of symptoms; and the average duration is said to be a little over a year.

IV. PYLORIC OBSTRUCTION AND ITS CONSEQUENCES.

ETIOLOGY.—The pylorus may be obstructed either from some morbid condition of the stomach, inducing stricture or stenosis; or from external pressure. The following list includes the main causes: 1. Cancer of the walls, especially scirrhus, which is by far the most frequent cause. 2. Cicatrization of an ulcer. 3. Corrosive poisoning and its results. 4. Hypertrophy of the coats, with thickening of the submucous tissue. 5. Spasmodic contraction of the muscular coat, due to an ulcer in the vicinity. 6. External pressure from—*a*, tumor of the pancreas; *b*, cancerous masses projecting from the liver; *c*, enlarged glands; *d*, very rarely a tumor connected with the gall-bladder.

EFFECTS.—Pyloric obstruction causes the stomach to become dilated, while its walls hypertrophy, especially the muscular coat, in the endeavor to overcome the interference with the passage of the food, the intestines at the same time being contracted.

SYMPTOMS.—There may be evidences of some organic disease of the stomach about the pylorus, or of something in its vicinity causing pressure; but the only positive clinical indications of pyloric obstruction are derived from the characters of the vomiting and of the matters rejected, with the presence of the physical signs of a dilated stomach. The vomiting comes on some hours after food, or only at intervals of a few days, a great quantity being then discharged. The vomit never contains bile, but is strongly acid, presents numerous sarcinæ and torulæ, and readily ferments. The stomach may be so much enlarged as to cause general distension of the abdomen. The physical characters of this enlargement are as follows: (i.) The shape of the stomach may be retained and made out by careful examination, while movements of the organ can sometimes be felt or excited. (ii.) On succussion a splashing sensation is often experienced when the stomach contains liquids. (iii.) Percussion shows extension of the stomach-note upwards

as well as downwards if the organ is empty. If it contains food or fluid, however, there is dulness below, as after taking a good draught of water; and this dulness may be made to alter its position by changing the posture of the patient. (iv.) If a probang is passed by the œsophagus, it may reach the bottom of the stomach and be then felt through the abdominal walls. (v.) Emptying the stomach by means of the stomach-pump may afford some aid. (vi.) Auscultation reveals a splashing sound on succussion; the sound of food or liquids falling into the stomach when swallowed; or loud heart-sounds reverberating through the space. (vii.) The heart may be displaced upwards. Occasionally the patient experiences a sensation as if the food passed too low in the abdomen.

Dilatation of the stomach may also result from obstruction of the duodenum, or, rarely, of the upper part of the jejunum. A certain degree of distension is due sometimes to deficient tone of the muscular coat, from weakness or want of proper innervation. As exceptional causes are to be mentioned local paralysis near the pylorus, interfering with the expulsion of food; hernia of the stomach through the diaphragm, or its displacement by an omental hernia; and accumulations of foreign substances in its interior, such as hair. Dilatation of the stomach has been attributed to sarcinæ, but this is extremely doubtful.

CHAPTER XXXV.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF CHRONIC GASTRIC AFFECTIONS.

I. DIAGNOSIS.

It will be most convenient to consider the diagnosis of stomach disorders according to certain groups in which they are presented in practice.

1. Many cases come under observation evidently belonging to the class of dyspeptics. It is requisite to determine what form of dyspepsia is present, and what are its causes. The two chief varieties to be distinguished are the atonic and irritative, which are mainly separated by the difference in the intensity and characters of the sensations in the epigastrium; the conditions of the tongue, mouth, and throat; the absence of thirst in the atonic form; the minor degree of general disturbance in the same, which is also of a different nature, there being no fever. Further, diarrhœa is often present in the irritative form; while in atonic dyspepsia there is generally persistent constipation.

With regard to the causes of any dyspeptic symptoms, these must be ascertained by a satisfactory inquiry into the habits of the patient, and into the condition of the various organs and general system. It is particularly necessary to recollect that they may depend upon a state of catarrh kept up by portal congestion, or upon some constitutional disorder, especially Bright's disease; or that they may be merely premonitory of some serious organic affection of the stomach. In order to see what elements of food are not properly digested, it has been proposed to evacuate some of the contents of the stomach at certain intervals by the aid of the stomach-pump, and thus obtain them for examination.

2. It is frequently difficult to diagnose between mere functional dyspepsia and the less serious organic affections, viz., glandular degeneration and chronic gastritis. The opinion has been already expressed that in many cases of irritative dyspepsia chronic gastritis is often present, and it is scarcely practicable to draw a line between them.

3. Young women not unfrequently present themselves, complaining of severe gastric pain, in whom it is difficult to determine with certainty whether they are suffering from mere gastralgia or nervous dyspepsia, or from perforating ulcer. In any really doubtful case it is safer to presume that the latter is the condition present. The chief distinctions are that in ulcer the pain is usually more localized, and is almost always much increased by food; there is a sense of soreness and deep tenderness, but often less superficial tenderness than in the other affections; vomiting occurs after food, usually affording relief, and there may be hæmatemesis; emaciation is generally marked; while there are none of the neuralgic pains in other parts, or signs of hysteria, so common in gastralgia and nervous dyspepsia.

4. In persons advanced in years more especially, but occasionally in younger individuals, symptoms are not uncommonly present which render the diagnosis between mere functional disorder and grave organic disease of the stomach—either chronic ulcer or cancer—for a time very doubtful. Persistent disturbance of digestion without any evident cause, and not yielding to proper treatment, should lead to the suspicion of the existence of serious organic disease, though it must be remembered that the symptoms may be due to glandular degeneration. The diagnosis would be rendered more positive by the presence of marked localized pain, increased by food, tenderness, vomiting, hæmatemesis, and progressive emaciation. Some of these symptoms, however, especially pain, I have known to be very intense in connection with mere functional disorder in females and gouty subjects. With regard to hæmorrhage, it is important to observe that the blood, if in small quantity, is sometimes not vomited, but passed entirely in the stools, and therefore in any doubtful case it is desirable to examine the fæces.

5. The diagnosis of chronic ulcer from cancer is frequently very difficult at first. The circumstances in favor of the latter are: The patient being a male and advanced in years; hereditary history of cancer; pain more constant and less influenced by food and vomiting; tenderness slight or absent; hæmorrhage not occurring in the earlier stages, but late in the case, and being on the small scale; marked and early digestive disturbances, appetite being much affected; considerable and rapid wasting, especially if independent of vomiting or loss of blood; and evidences of the cancerous cachexia. Later on, the discovery of a tumor, especially near the pylorus; signs of obstruction of the pyloric orifice, with dilatation of the stomach; inefficiency of treatment; the almost continuous and speedy progress of the case; and perhaps signs of cancer in other parts, usually serve to render the diagnosis plain. It is necessary to guard against mistaking a contracted rectus for a tumor.

With regard to the part of the stomach involved, this can often be made out by noting the exact seat of the pain and tenderness; the relation of pain and vomiting to food and posture; the state of the stomach, as to contraction or dilatation; and the locality of any physical signs.

6. Affections of the stomach may simulate neighboring diseases, or *vice versâ*, especially disease of the duodenum or head of the pancreas; cancer in the small or large omentum; hepatic affections; the passage of a gallstone; diseases of the glands in the vicinity; affections of the transverse colon; and painful conditions of the abdominal walls. In any doubtful case a correct diagnosis can only be arrived at by a careful consideration of all its details.

7. Occasionally rare conditions in connection with the stomach give rise to much difficulty in explaining symptoms associated with this organ. Of such which have come under my own notice I may mention abscess in the walls of the stomach; and hernia through the diaphragm. On the other hand, it must be remembered that extensive organic disease may exist, even cancer involving a considerable portion of the organ, without any or with only slight local symptoms, there being merely profound interference with the general nutrition.

II. PROGNOSIS.

The prognosis in any case of dyspepsia will depend mainly on the time the symptoms have lasted; their causes, and whether these can be removed; and the ability and willingness on the part of the patient to submit to appropriate treatment. When indigestion has become a habitual condition, it is frequently very difficult to cure, especially if it is associated with permanent organic changes in the coats and glands of the stomach, with conditions keeping up venous congestion, or with

some general disease; or if the patient persists in injurious habits. Most cases may, however, be restored if properly attended to, or at all events may be much improved. If there is ~~reason to believe~~ that the mucous coat of the stomach with its glands has undergone ~~serious~~ morbid changes, especially after the abuse of alcohol, this condition is highly dangerous, owing to the interference with digestion and nutrition, and the patient may gradually sink from marasmus. Persistent dyspepsia occurring in the course of various chronic diseases often renders their prognosis much more grave.

Gastralgia is frequently difficult to get rid of and may prove serious, especially in elderly persons, on account of the severity of the pain, and because this prevents them from taking food.

Gastric ulcer is necessarily a dangerous lesion. The variety which occurs in young women is the more immediately grave, on account of its tendency to perforation and hæmorrhage. A large proportion of these cases, however, recover, the ulcer cicatrizing. The chronic ulcer shows much less disposition to heal, but is not nearly so liable to a speedily fatal issue, death usually taking place slowly by asthenia. In proportion to the severity of the stomach symptoms—pain, vomiting, and hæmorrhage—is the prognosis more grave. The effects of cicatrization may become serious.

Cancer is necessarily a fatal disease, and the question can merely be one of duration. This must be determined by the characters of the symptoms, and the progress of the case. Rarely does the duration extend beyond two years, and generally it is much less than this.

III. TREATMENT.

There are certain principles to be followed in the management of all chronic gastric affections which will now be considered, anything calling for special notice being pointed out in the course of the remarks.

1. Regulation of the diet is obviously the first consideration in all cases. This involves not merely directions as to what should be taken, but also with regard to quantities, intervals, proper mastication, and other matters. In many cases of dyspepsia this is the chief thing needing attention, without which all other means are usually unavailing. It would occupy too much space to indicate all the modifications of diet required in different forms of stomach derangement, and, indeed, this has generally to be determined by the experience of each individual patient. There are, however, certain broad facts which may be stated. In all cases substances which are known to be indigestible, such as pastry, cheese, many fruits and vegetables, fresh bread, and most made dishes, must be avoided, and plain food only be taken. Meat is decidedly beneficial in atonic dyspepsia, fresh beef and mutton, not too fat and properly cooked, being those which are most suitable. Pork,

veal, and salted meats must be forbidden. In proportion to the degree of irritation present, and especially if there is chronic gastritis, does it become requisite for the diet to be more bland and easily digestible. In such cases white fish, light soups, chicken, game, jellies, calves' feet, sweetbread, the yolk of eggs, milk puddings, and such articles answer best, and it is often better to give food in small proportions at rather frequent intervals, than in any considerable quantity at a time.

The question of drink calls for special notice. Many patients suffer from abuse of tea, and it is frequently desirable to forbid this absolutely, and order cocoa or milk instead, the latter being advantageously mixed with lime or soda-water. Instructions must also be given against taking large quantities of cold water, especially during meals. A glass of good bitter ale or stout with meals is often beneficial in atonic dyspepsia, provided it does not produce flatulence; a moderate quantity of wine may also be useful, just before and with food, especially dry sherry, champagne, claret, or hock. When there is an irritable condition of the stomach, much care must be exercised in the use of stimulants.

In functional disorders of the stomach attended with severe pain after food, it is sometimes requisite to insist upon patients taking meals properly, as they will otherwise go without, and are thus only aggravating the mischief; underdone meat is beneficial in many of these cases, and it may be pounded. Where mastication is impracticable, food must be artificially divided before it is taken; in the case of old people and others who have lost their teeth, it is often extremely serviceable to provide them with a set of artificial teeth.

In treating gastric ulcer, especially the perforating variety, diet is all-important. To promote the healing process and prevent untoward events, one main object is to keep the stomach in as absolute a condition of rest as possible. Hence anything which can in the least irritate or give rise to flatulent distension must be absolutely avoided. Further, the food should consist of liquids or pulpy materials, such as thick soups, pounded underdone meats, meat extracts, milk, either alone or thickened with corn-flour or arrowroot, the yolk of eggs beaten up or soft boiled, and these must be given only in small and regulated quantities, at stated intervals. In treating young women suffering from perforating ulcer it has been well recommended to keep the patient in bed for some weeks, so that less nutriment may be required, and thus the stomach be less disturbed. Some have even gone so far as to advocate that the patient should be entirely supported by nutrient enemata, but this is rarely required.

In cancer no rules can be laid down, but as digestible and nutritious food as possible must be given, each case being managed on its own merits. It may not be altogether useless to remark, that both in cancer and ulcer the position assumed during and after the taking of food has sometimes an influence in the way of relieving pain and other symptoms.

In some cases it is requisite to be particular as to the elements of food which are permitted. Thus, if there is much tendency to acid fermentation, starchy substances are contraindicated. Marcet and Pavy have recommended in certain conditions the employment of food artificially digested before its administration.

2. The next matter requiring attention is general hygienic management. Many cases of functional disorder of the stomach, as well as of chronic catarrh, and even of ulceration, are greatly benefited by attention to various matters coming under this head, of which only the chief can be mentioned, without entering into details, viz., the taking of a proper amount of exercise, but not immediately before or after a meal; avoidance of much mental work, harassing anxiety, and brooding over symptoms; mingling in cheerful society; change of air and scene; abstinence from injurious habits, such as intemperance or excessive smoking; promotion of the action of the skin by cold bathing or douching, if this agrees, or by an occasional warm bath or Turkish bath; and the wearing of warm clothing, with flannel next the skin.

3. Coming next to the employment of therapeutic agents, in the first place those medicines require notice which act more directly upon the stomach. These must not be given indiscriminately, and much care is required in their administration. They act by increasing the appetite; giving tone to the stomach and aiding its muscular contractions; promoting the secretion and improving the quality of the gastric juice, or on the other hand checking excessive secretion; or by producing a sedative effect upon the stomach. The chief remedies include alkalies, viz., liquor potassæ, the carbonates of soda, potash, or ammonia; mineral acids, especially hydrochloric or nitro-hydrochloric and phosphoric; tincture or extract of nux vomica or strychnia; cinchona or quinine, which, however, must be used with particular caution, as they are apt to disagree; vegetable and aromatic bitters, viz., calumba, gentian, orange-peel, quassia, chiretta, cascarilla, chamomile, absinthe, and hop; aromatics and stimulants; carbonate or nitrate of bismuth. These may be variously combined, and among the most useful combinations may be mentioned an alkali with tincture or infusion of calumba or gentian and aromatic spirits of ammonia; dilute hydrochloric acid with the same bitters or with orange-peel, to which tincture of nux vomica (℞ v to x) may often be very advantageously added; bismuth with carbonate of soda and some bitter infusion. Hydrocyanic acid is in many cases a useful addition to these mixtures. When giving the vegetable bitters it is desirable to begin with a moderate dose, as they sometimes disagree at first. Medicines for promoting secretion are best administered shortly before or during meals. Alkalies certainly act in this way; acids may be used to check excessive secretion, when given just before meals, but their continued administration also seems to increase and improve the gastric juice, by improving the condition of the lining membrane and

its glands. *Ipecacuanha*, in doses of gr. $\frac{1}{2}$ to i in pill, has been recommended as a promoter of secretion; and also hot condiments and other stimulants. The last are useful in some cases, but the habit of always taking them before meals is decidedly to be deprecated.

When there are evidences of much gastric irritation, most benefit is usually derived from the use of bismuth with alkalies and hydrocyanic acid, to which morphia may be added should there be much pain. Sometimes, however, mineral acids act well in this condition; and occasionally, even when there are distinct signs of subacute gastritis, I have known strychnine to be the only remedy affording relief. In cases of continued gastrorrhœa some of the most efficacious medicines are oxide of zinc, oxide or nitrate of silver in minute doses, and vegetable astringents. Arsenic is also recommended. Opium or morphia is of great value in some morbid states of the stomach, particularly in that which is due to chronic alcoholism. Dr. W. Fox has found the compound kino powder very useful in these cases. In that variety of indigestion in which the food passes immediately out of the stomach, I have found most benefit from the administration of bismuth before meals, combined with tincture of opium (ἡνι—viiij).

Important remedies are also employed as substitutes for the gastric secretion, viz., hydrochloric acid and pepsin, either separately or in combination. In some cases it is advisable to mix these with the food before it is taken; or they may be administered during meals. They aid also in preventing the decomposition of food which is so apt to occur. Lactic acid has been likewise used for this purpose.

The drugs thus far considered are often of service in cancer and chronic ulcer, and may be tried should symptoms seem to indicate a necessity for them. With regard to medicines which directly promote the healing of an ulcer, nitrate or carbonate of bismuth is supposed to act thus, given in gr. x doses every four or six hours, and also nitrate or oxide of silver; either of these may be combined with opium or morphia. There is no known remedy which has the least direct influence upon cancer of the stomach.

4. Symptomatic treatment almost always demands attention in stomach complaints. The chief symptoms which call for interference are pain; nausea and vomiting; heartburn and acidity; flatulence; eructations; pyrosis; constipation or diarrhœa; and in certain cases hæmatemesis or perforation. The treatment of most of these has already been fully considered. Pain may be relieved by opium, morphia, hydrocyanic acid, belladonna, conium, spirits of chloroform, or chloral internally: with external applications over the epigastrium, viz., dry or moist heat; cold in some cases, especially of cancer; anodyne fomentations; turpentine stupes; sinapisms; or, if the pain is continuous, a small blister, which may be dressed with morphia, or a belladonna or opium plaster. If the pain is severe, subcutaneous injection of morphia may be em-

ployed. Frequently it is associated with flatulence or acidity, and is then relieved by removing these conditions. Flatulence and eructations are usually much diminished by the use of the medicines already considered, which act upon the stomach and food. A combination of bismuth with freshly-prepared charcoal, given after meals, is efficacious in preventing the former; as well as such remedies as assafoetida, galbanum, musk, valerian, sumbul, spirits of ammonia, oil of rue or cajeput, and peppermint. Sometimes small doses of creasote, carbolic acid, sulpho-carbolates, or hyposulphites may be given with benefit. Acidity and heartburn are best relieved by a little carbonate of soda or potash, magnesia or carbonate of magnesia. Frequent acid eructations are generally an indication for mineral acids; they may depend on excessive formation of gastric juice, or fermentation of food from deficiency of this secretion. Pyrosis is usually checked by bismuth in full doses combined with alkalies. Should there be habitual constipation, it is very important to avoid the constant employment of strong purgatives if possible. Vichy, Seltzer, Friedrichschall, and other mineral waters are often very serviceable in this condition.

5. It must not be forgotten that the state of the general system, as well as that of the main organs, needs due consideration in all cases of stomach disorder. Many of the remedies already alluded to act as general tonics, and thus aid in improving digestion. Among the conditions requiring particular notice are anæmia, which must be treated by mild ferruginous preparations; hepatic derangements, calling for an occasional dose of mercury or podophyllin; gout; hysteria; malarial affections; and renal disease. Gastralgia is usually much benefited by iron, strychnia, and various other nervine tonics.

6. With regard to those conditions in which the stomach is much dilated, it has been recommended to use the stomach-pump systematically; and also to wash out the organ, using various injections, especially those of an antiseptic character.

CHAPTER XXXVI.

ON CERTAIN INTESTINAL SYMPTOMS AND FUNCTIONAL DISORDERS.

I. ENTERALGIA—INTESTINAL COLIC.

ETIOLOGY.—It is very probable that neuralgic pains may be felt in connection with the intestines, corresponding to gastralgia in the stomach; colic, however, is attended with irregular spasmodic contraction

of the muscular coat. Its causes are: 1. Irritation of the bowels by improper or undigested food; cold drinks or ices; irritant, acrid, or poisonous substances; excessive or morbid secretions, especially bile; retained *feces*, colic being often associated with constipation and flatulence; and foreign bodies, such as fruit-stones, gallstones, or worms. 2. Organic diseases of the intestines; and the different forms of obstruction. 3. Reflex irritation, *e. g.*, from ovarian and uterine affections, or the passage of a renal or hepatic calculus. 4. Morbid conditions of the blood, especially in gout and perhaps rheumatism. 5. Lead-poisoning. 6. Disorders of the nervous system, particularly in connection with hysteria, or as the result of strong emotion. 7. Occasionally exposure to cold, either generally or locally.

SYMPTOMS.—These are usually quite characteristic. Paroxysmal pains are felt in the abdomen, often coming on quite suddenly, and presenting remissions or intermissions. They generally begin and are most severe about the umbilical region, but may spread over the entire abdomen, and are liable to change their site constantly. As a rule the pain is of considerable intensity, being sometimes most excruciating during the exacerbations, while in character it is more or less twisting, pinching, or constricting, what is commonly called griping. Pressure almost always gives marked relief, the patient either bending forwards and pressing with the hands, or lying upon the abdomen; at the same time being very restless, rolling and tossing about from time to time. Should the spasm continue for a long time, a little soreness may be left. Ordinarily the bowels are constipated and distended with flatus; diarrhoea may be present, however, in some conditions. Occasionally vomiting takes place, but then probably the stomach is affected. *Physical examination* generally discloses flatulent distension, except in lead-colic, which will be separately considered hereafter; while the spasmodic movements of the bowels and rolling about of flatus can often be felt. The abdominal muscles are also commonly in a stage of rigid contraction, or knotted here and there.

The patient presents an expression of suffering, and if the pain is very severe and prolonged, there may be symptoms of more or less collapse. Pyrexia is absent. The attack lasts a variable time, and usually ends abruptly, being followed by a feeling of great relief and comfort.

TREATMENT.—The first thing to be attended to is to find out the cause of the colic, and get rid of this. A free aperient enema is generally useful, to which may be added some turpentine or *assafoetida* if there is much flatulence; or a brisk purgative may be given by the mouth in less urgent cases, such as a full dose of castor oil, alone or preceded by calomel, a black draught, or one containing sulphate and carbonate of magnesia with peppermint-water. Opium is the chief remedy for the relief of pain and spasm; it is best given in the form of tincture or liquor opii sedativus, which may be combined with spirits of

chloroform and tincture of cardamoms. In severe cases subcutaneous injection of morphia may be employed. Warm carminative drinks are beneficial, or a little hot spirit and water. Should the attack be associated with hysteria, a draught containing tincture of valerian or *assa-fetida* is indicated. The patient should be kept warm; and the assiduous application of dry heat over the abdomen, with friction, will usually afford great relief. Some prefer hot fomentations. Any signs of collapse must be combated by stimulants. It may be remarked that infants probably suffer often from colic, on account of improper feeding. This must be prevented by careful attention to diet; but should it arise, carminative waters may be given, with magnesia or a little castor oil, and heat applied over the abdomen.

II. CONSTIPATION.

ETIOLOGY.—The immediate causes of this very common symptom may be summed up as: 1. Mechanical obstruction in some part of the alimentary canal, interfering with the passage of the *fæces*. 2. Deficient peristaltic action of the intestinal muscular coat, especially of the large bowel, generally due to impaired excitability of the nerves. 3. Deficiency of secretions, particularly the intestinal secretion and bile; or, as some believe, their excessive absorption; the *fæces* being hence too solid, while at the same time the peristaltic action is diminished.

The first class of causes will be separately considered. The others may be associated with organic diseases, but are very frequently the consequence of mere functional disturbance. This may arise from a great variety of causes, of which the chief are habitual neglect of the act of defecation, either from carelessness, want of time, or undue modesty; indulgence in astringent articles of diet; habitual use of opium; excess in smoking; sedentary habits, especially if combined with much mental work; enervating habits, particularly lying to a late hour in bed; *anæmia*, debility, and want of tone from any cause; *dyspepsia*, particularly if accompanied with much flatulence; most acute febrile diseases; various chronic affections, especially those connected with the nervous system; uterine and ovarian derangements; and the presence of lead in the system.

Undoubtedly some individuals are predisposed to constipation, particularly those who are of a slow, lethargic temperament. This disorder is more common in females, and is more liable to arise as age advances, though it is very frequent in young women, especially in connection with hysteria.

SYMPTOMS.—Constipation simply means that the stools are not passed often enough, being at the same time generally deficient in quantity, as well as too dry and solid. In many instances it is a mere temporary derangement; but in others the bowels are habitually confined. Some

individuals state that their bowels are regular, simply because they go to stool every day, but in reality they suffer from habitual constipation, as they only pass small lumps of hard *feces*; hence the necessity of making close inquiry in any doubtful case. The degree of constipation varies much, but it is not uncommon to meet with patients, especially females, whose bowels are only moved once or twice a week; and sometimes the intervals are even longer than this, being in exceptional cases quite extraordinary. Hence *feces* may accumulate to an enormous amount in the intestines, distending them greatly; and when discharged they are firm, often extremely hard, dry, in the form of scybulous lumps or large masses, frequently pale and unusually fetid. Hard excrement may set up irritation, and excite a kind of diarrhœa attended with the discharge of mucus or pus, and thus may mislead as to the actual conditions present, the *feces* being in reality retained. The passage of indurated *feces* may give rise to a great deal of pain about the anus, with straining, and sometimes discharge of blood. When retained, excrement is very liable to undergo decomposition, thus giving rise to much painful flatulence; the secretions are also still more interfered with, as well as the motor functions of the bowels, and dyspepsia, usually of an atonic kind, is set up. The mechanical effects of accumulated *feces* are often very serious, and they may cause complete obstruction or ulceration and perforation; they not uncommonly can be detected by physical examination of the abdomen as tumors, which may simulate various other abdominal enlargements. As a rule these correspond in position and shape to the cæcum, or some part of the colon; they often have a doughy feel, yielding to pressure, by which they are sometimes much altered; and percussion generally elicits a combination of dulness and tympanitic sound. In some cases, however, these accumulations produce extensive, irregular, solid enlargements, greatly resembling those due to cancer. Therefore the possibility of any doubtful tumor being due to *feces* should always be borne in mind, and the effects of aperients and enemata observed before a positive opinion is given.

Upon the general system the effects of habitual constipation are frequently very marked. It produces a state of nervous depression; and by interfering with digestion and nutrition may cause much wasting and anæmia.

TREATMENT.—It is needless to enumerate here the various remedies employed for accidental constipation, as these are discussed in therapeutic works. A few remarks as regards the management of habitual constipation are, however, necessary. 1. It is most important to impress upon patients the necessity of paying attention to the habit of going to stool daily, at the same hour, and having a proper evacuation, because if this is neglected for a long period it becomes extremely difficult to restore the bowels to their normal activity. 2. Change in diet

may assist in removing constipation. Astringent articles of food must be avoided. Bran-bread, oatmeal cakes, and porridge, certainly prove efficacious in not a few cases; and figs, or rather acid fruits, are also useful in some instances. Any injurious habits which tend to confine the bowels must be avoided, and a proper amount of exercise be taken. Cold bathing, with douching of the abdominal walls, is often beneficial; and in women with relaxed walls, the plan of wearing a broad bandage round the body, firmly applied, is exceedingly serviceable. 3. It must not be forgotten that the inactivity of the bowels may be due to a general want of tone, and hence tonics are frequently useful, particularly those which improve the condition of the alimentary canal; the most beneficial are the non-astringent preparations of iron, mineral acids with bitter infusions or tinctures; strychnia, and extract or tincture of nux vomica. Should there be any lead in the system giving rise to constipation, iodide of potassium is the remedy. 4. Various aperient medicines have usually to be employed, but it is highly desirable to avoid falling into the habit of taking these, if possible, especially the stronger purgatives, and therefore in any case as soon as the desired effect has been produced, and the bowels have been properly emptied, purgatives should be stopped, and the patient impressed with the importance of trying to keep up a regular action by attention to the matters already alluded to. Among the most efficacious aperients in these cases are confection of senna or sulphur, taken early in the morning; compound rhubarb pill; sulphate of magnesia, $3\frac{1}{2}$ to $3i$ three times a day, which is often beneficially combined with sulphate of iron; sulphate of potash, particularly recommended for children; aloes, in the form of extract or decoction, especially valuable if the colon is torpid; and extract of belladonna in doses of $\frac{1}{8}$ th to $\frac{1}{4}$ th gr. once a day. The last-mentioned has deservedly come into high repute, and has been particularly recommended by Trousseau; a combination of this remedy with extract of nux vomica is very serviceable in some cases. Not uncommonly it becomes necessary to use stronger purgatives from time to time, such as extract of colocynth, blue-pill, calomel, jalap, or gamboge. If the bile appears to be deficient, podophyllin is valuable, or some recommend inspissated ox-gall. Some of these remedies may be given in different combinations with advantage, made up into pills with extract of gentian or extract of hyoscyamus. It seems best to administer them just before or during a meal. Various aperient mineral waters are often serviceable, especially Friedrichschall water.

The employment of simple enemata in cases of habitual constipation is not carried out to the extent which it deserves. Unquestionably a morning injection of water, soap and water, or a solution of salt, will often prove highly efficacious; if necessary a little castor oil may be added. The use of a suppository of soap is a popular remedy in some

parts, especially in the case of children. It has been recommended to galvanize the abdominal walls.

Occasionally, as the result of long-continued accumulation, the rectum becomes greatly distended with solid and dry excrement, which has to be mechanically scooped out. Enemata may be used to aid in softening this hardened fæces, and breaking it down.

III. DIARRHŒA.

ETIOLOGY.—Diarrhœa results either from increased peristaltic action of the intestines; an unusually liquid state of their contents, especially when due to excessive secretion; or, most commonly, from both these conditions combined. The *exciting causes* of these morbid phenomena may be thus arranged: 1. Irritation of the intestines by food, either taken in excess, of improper quality, or having undergone decomposition; impure water or other liquids; purgative medicines and irritant poisons generally; excessive or unhealthy secretions, especially bile; worms, trichinæ, and other parasites, possibly vegetable as well as animal; or retained fæces. 2. Mechanical congestion of the intestinal vessels, owing to some obstruction in the portal circulation. 3. Organic affections of the intestines, viz., enteritis, either acute or chronic; albuminoid infiltration, and ulceration. 4. Occasionally mere nervous disturbance, *e. g.*, strong mental emotion, or reflex irritation in connection with dentition. 5. Certain diseases in which diarrhœa is a prominent symptom, especially cholera, typhoid fever, and dysentery. By many it is then regarded as eliminatory in its character, serving to carry off some poisonous material; and the same theory is applied to its occurrence in renal disease, gout, pyæmia, and various fevers, or when it takes place as a critical discharge at the close of pyrexial affections. Diarrhœa not unfrequently sets in during the course of certain wasting chronic affections, especially towards their termination, aiding in bringing about the fatal result, especially in phthisis, cancer, splenic, or suprarenal disease, and Hodgkin's disease. 6. The rapid suppression of discharges, or the absorption of dropsical fluid, when the diarrhœa is termed vicarious. 7. Causes of a more general character, viz., exposure to changes of temperature, or excessive cold or heat; foul air, overcrowding, and other anti-hygienic conditions; excessive fatigue; emanations from decomposing animal matter, and malarial influence. The combined action of some of these, along with improper diet, gives rise to the summer and autumn diarrhœas so prevalent at these seasons. 8. Very rarely the escape of some fluid accumulation into the intestines; such as the contents of an abscess, peritoneal effusion, or hydatid tumor.

CHARACTERS.—In all cases of diarrhœa it is requisite to ascertain its duration; the number of stools passed in the twenty-four hours; their

relation to the introduction of food, if any; and also to inspect specimens of the discharges, if practicable, as frequently as may be desired. The principal varieties of loose stools are feculent; hemorrhagic, when they contain gelatinizable fragments of food, in some cases scarcely at all changed in the feces; or watery, also called a *flux*; mucous or gelatinous, the light fatty patients' diarrhoea or white flux. As a rule the materials are more or less mixed, and by an examination of the character of the stools the cause of the diarrhoea may be often determined. Various other digestive disturbances are usually associated with this symptom, as indicated by griping or other pains in the abdomen, sickness, hoarse or painful straining at stool, or an abnormal state of the tongue. The stools may irritate the anus considerably, especially when the diarrhoea is long-continued and of a watery kind. It must be remarked that patients sometimes state that they are suffering from looseness of the bowels, when on investigation it will be found that there is only some local discharge, especially in connection with fistula in ano. The association of mucous discharge with retained feces has already been alluded to.

If diarrhoea is considerable or of long duration, it necessarily causes debility and wasting, in some instances very rapidly and to a marked degree.

TREATMENT.—The first matter as regards the treatment of diarrhoea is to determine whether it should be stopped or not. In some instances this is not desirable, provided it is not excessive, the discharge by the bowels being preservative, as, for instance, in connection with Bright's disease or portal congestion. Some even go so far as to promote diarrhoea in certain diseases, such as cholera and typhoid. As a rule it is necessary to check it entirely or partially. For this end the diet must be strictly regulated, and this may be the only thing needed, especially in the case of children. Milk with farinaceous articles, especially arrow-root and corn flour; weak beef tea thickened with these materials; and milk puddings constitute the best articles of diet. Milk with lime-water properly administered will often speedily put a stop to the diarrhoea of children. In some cases a little brandy and water, or a mixture of brandy with port wine is beneficial. Not uncommonly an aperient is indicated at the outset, with the view of getting rid of irritant materials. Castor oil, calomel, a saline draught or Seidlitz powder, or a full dose of tincture of rhubarb act best in these cases, and they are often advantageously combined with a little opium. Antacids, such as carbonate of soda or magnesia, are beneficial when there are irritating secretions in the bowels.

Among the direct remedies for combating diarrhoea opium holds the first place, given either alone or with other medicines, in the form of pill, tincture, confection, various powders, enema, or as syrup of poppies. An injection of ℥i5 to 20 of laudanum with ℥iiss.—ij of decoction

of starch often acts most beneficially. The other principal medicines administered in acute cases are prepared chalk, aromatic confection, catechu, kino, logwood, krameria, alum, dilute mineral acids, especially sulphuric, tannic and gallic acids, carbonate or nitrate of bismuth, chloral, and chlorodyne; in chronic cases tincture of sesquichloride or solution of perntrate of iron, acetate of lead, sulphate of copper, or nitrate of silver. Ipecacuanha is invaluable in certain forms of diarrhœa. Among the most efficient combinations will be found chalk mixture with catechu and opium; compound chalk or kino powder, with or without opium; decoction of logwood with lime-water, particularly valuable for children; dilute sulphuric acid and laudanum; Dover's powder, alone or with carbonate of bismuth; and, in chronic cases, pills containing acetate of lead or sulphate of copper with opium.

Creasote, carbolic acid, and other antiseptics have been employed in certain forms of diarrhœa, with the view of destroying vegetable parasites with which it is supposed to be associated.

Local applications to the abdomen are frequently very beneficial, in the form of poultices, fomentations, or dry heat. A flannel bandage round the abdomen is useful in some chronic cases. Occasionally a patient may by voluntary effort to some extent suppress diarrhœa, especially when this is due to emotional disturbance.

IV. MELÆNA—INTESTINAL HÆMORRHAGE.

ETIOLOGY.—Most of the causes of melæna are similar to those which give rise to hæmatemesis, and it will be sufficient briefly to enumerate them thus: 1. Traumatic injury. 2. Diseased conditions of the blood. 3. Vicarious. 4. Mechanical and chemical irritation or destruction of the bowel, especially by violent purgatives, cantharides, turpentine, various irritant poisons, hardened feces, and rough calculi. 5. Organic diseases, viz., enteritis, ulceration, especially in typhoid fever and dysentery, cancer, invagination, piles, prolapsus, fissures or fistule about the anus. 6. Extreme mechanical congestion, from portal obstruction or after heart or lung disease. 7. A tumor eating its way into the intestines; or an aneurism bursting there. 8. Passage of blood from the stomach into the bowels, following hæmorrhage into this organ.

CHARACTERS.—When blood appears in the stools it is generally much altered in characters, but this will depend upon its amount and source, and the rapidity with which it escapes. When in small quantity, coming from the upper part of the bowels and slowly discharged, it is more or less dark, often being quite black and presenting a tarry or sooty aspect; or it may resemble coffee-grounds. If from the same source, but copious and speedily removed, it may be but little altered, though it is usually of a very dark color. When coming from the large intestines, especially near the anus, it is generally quite bright and un-

changed. The quantity varies much, ranging from mere streaks to an amount sufficient to cause speedy death. By attending to the quantity and appearances of the blood, its seat of origin may generally be determined, aided by the general features of the case, and a consideration of the symptoms and physical signs referable to the abdomen, not forgetting to make an examination of the anus and its vicinity. Care must be taken not to mistake the dark color due to bile or iron for that depending on the presence of blood.

TREATMENT.—The same remedies are useful in *melæna* as in *hæmatemesis*. Oil of turpentine is in much repute. Enemata of iced water are sometimes serviceable; as well as the application of ice-bags to the abdomen. Of course if there is any morbid condition about the anus giving rise to hæmorrhage, such as piles or fistula, surgical interference will be required.

CHAPTER XXXVII.

INFLAMMATION OF THE INTESTINES—INTESTINAL OR ENTERIC CATARRH—ENTERITIS—DUODENITIS—TYPHLITIS AND PERITYPHLITIS.

INFLAMMATION of the bowels presents considerable varieties as to the coats which are involved, and the extent of the intestinal tract which is implicated; hence the clinical history of this disease is anything but uniform. The term enteritis has been used very vaguely, and several distinct conditions have been included under it. It will be convenient briefly to consider in the present article all forms of disease in which the intestines generally, or any portion of them, are inflamed, apart from special affections, such as dysentery or typhoid fever.

ETIOLOGY.—The causes of intestinal inflammation are very similar to those which induce gastritis. Enteric catarrh is ordinarily due to some direct irritation by food or other materials, or to a cold; it is also frequently associated with various exanthemata and dentition. Irritant poisons give rise to more severe inflammation. A very intense form follows obstruction of the bowels; this also sometimes results from ulceration, or from extension of peritonitis; and is said to occur in rare instances idiopathically. The local variety named *typhlitis* or *inflammation of the cæcum* is generally due to the lodgment of hardened feces or foreign bodies in this part of the intestine or in the appendix vermiformis, which often ultimately leads to ulceration and perforation. *Duodenitis*, followed by ulceration, is peculiarly liable to be set up after burns and scalds. Chronic intestinal catarrh remains occasionally after an acute attack, but usually results from the repeated

action of irritants, or is associated with ulceration, lardaceous disease, or other organic changes.

ANATOMICAL CHARACTERS.—In the milder forms of catarrh, the appearances resemble those observed in catarrh of other mucous surfaces, and need not be described. The secretions are abundant and often very irritating, being sometimes mixed with blood. Superficial erosions or slight ulcerations are not uncommon. Occasionally a croupous or membranous deposit is observed over the surface more or less extensively, which indicates greater intensity of the inflammatory process. Should this be very violent, implicating the entire thickness of the gut, the color is extremely deep, sometimes purple or almost black, with spots of extravasation; all the coats are thickened and softened, generally infiltrated with serum, or occasionally with exudation or pus; while the intestinal contents are often mixed with blood. Gangrene occurs in some cases. The peritoneum may be involved by extension, exhibiting patches of lymph corresponding to the inflamed bowel.

In simple catarrh the entire mucous tract is frequently affected, the condition beginning above and extending throughout the intestines; it may, however, be limited. The more severe forms are usually confined to short portions, which are generally much distended, particularly when the inflammation depends upon obstruction, the part beyond being contracted.

In typhlitis the cæcum or appendix becomes much inflamed from irritation, and this leads to ulceration and destruction of the coats, which is liable to end in rupture or perforation. The perforation may take place into the peritoneum, causing peritonitis; or into the surrounding cellular tissue, setting up inflammation there—*perityphlitis*—which usually terminates in the formation of an abscess, and this, if not opened, may burst in a variety of directions. Possibly perityphlitis may be excited independently of any actual perforation. The cause of the irritation is usually some foreign body or hardened feces. In the appendix some small foreign substance which has gained an entrance becomes a nucleus upon which feces and secretions are deposited, forming concretions which come to resemble fruit-stones, for which they have been mistaken. Of course it must be remembered that perforation may result from other forms of ulceration which are met with in the cæcum; from mere distension of this part of the intestine; or from its destruction by some extrinsic growth. The same course of events is now and then observed on the opposite side of the abdomen, in connection with the sigmoid flexure. A localized variety of inflammation has also been described in the colon—*colitis*—supposed to be distinct from dysentery, beginning in the submucous tissue, but soon causing extensive destruction of the mucous membrane.

When intestinal catarrh becomes chronic, there are the usual changes in color, which is often dark or even black from pigment; thickening

and induration of tissues; with degenerative changes in the gland-structures. Chronic catarrh may give rise to ulceration; or it may result from this or some other organic change in the bowel.

SYMPTOMS.—Cases of simple enteric catarrh are characterized generally by uneasiness over the abdomen, with colicky and griping pains, especially about the umbilicus, where there may be a little tenderness, though pressure sometimes gives relief; formation of much gas in the intestines, causing gurgling and borborygmi; and diarrhœa, especially after taking anything, the stools becoming in some cases very numerous, being at first feculent, but soon assuming a watery, irritating character. These may be the only symptoms, but as the stomach is often implicated at the same time, this is indicated by a red, furred, and dryish tongue, impaired appetite, thirst, and a tendency to nausea or vomiting. In duodenal catarrh jaundice is frequently observed, owing to the closure of the common bile-duct by the swollen membrane; and if the duodenum is solely involved, there is corresponding localized pain and tenderness, with constipation instead of diarrhœa. Occipital headache is also said to be common. If diarrhœa has been severe for any time, the stools are apt to become somewhat dysenteric in character, containing mucus and blood, especially if the large intestines are mainly implicated, when there may be much tenesmus and straining at stool.

The symptoms are more marked in proportion to the intensity of the inflammation, especially the pain and tenderness, and they are particularly severe in connection with irritant poisoning. Should there be any membranous deposit upon the mucous surface, shreds, larger patches, or even intestinal casts of this material may be expelled in the stools.

General symptoms are in some cases entirely absent, except, perhaps, some feeling of exhaustion from excessive diarrhœa. In the more severe forms of enteritis, pyrexia is observed, with languor, general depression, and headache. In children there is frequently high fever, with much prostration, a greatly distended abdomen, and aphthous stomatitis. Sometimes convulsions or coma set in, and death may result from this cause, or from exhaustion. In cases of poisoning the general symptoms are grave, there being often a tendency to collapse; and the same thing is occasionally observed in severe enteric catarrh from other causes, especially in persons constitutionally weak, or who are the subjects of some chronic lowering disease.

The limited intense form of inflammation which involves all the coats has symptoms essentially distinct from those just described, and it is to this variety that many authors limit the term *enteritis*. Here the affected portion of the intestine, which is at first the seat of spasm, soon becomes paralyzed, so that the contents cannot pass along, but accumulate in the part above. The early symptoms are much localized;

pain with tenderness, often referred to the umbilical region, increased by movement, along with general colicky pains and tormina; obstinate constipation; constant nausea and vomiting; thirst; a furred tongue; and pyrexia, preceded by rigors, the patient presenting a distressed and anxious expression. In a short time, if there is no relief, the abdomen swells from tympanitis, while the painful sensations subside more or less, in some cases completely; the vomiting gradually becomes sterco-raceous, at last the materials coming up without any effort; the tongue assumes adynamic characters; and signs of collapse set in, with a pinched countenance, and extremely feeble and irregular pulse, the brain being either unaffected to the last, or death being preceded by low nervous symptoms. The urine is much diminished or suppressed. Hiccough is often a distressing symptom.

Typhlitis is generally indicated at the outset by pain and tenderness in the right iliac fossa, often severe; with, in some instances, distinct physical signs of an accumulation in the cæcum; and constipation, followed by mucous or muco-purulent diarrhœa. Sudden perforation may take place into the peritoneum, even when there have been no previous serious symptoms. In other cases perityphlitis is set up, as evidenced by local redness; a firm swelling; œdema of the skin; increase of pain and tenderness; rigors and pyrexia; followed usually by signs of the formation of an abscess, which may open in various directions, either externally or internally, sometimes thus setting up peritonitis. The pus has often a fecal odor, and may be mixed with actual fæces or gas. If the case is not speedily fatal, a permanent opening may remain, death occurring gradually by hectic; or ultimately recovery may ensue, the abscess healing up. The same symptoms are observed in rare instances in the left iliac fossa, in connection with the sigmoid flexure.

Chronic intestinal catarrh frequently has no other symptom than chronic diarrhœa, the stools being liquid, pale, fermented, often very offensive, or lienteric, varying much in number and quantity. In many cases uneasy griping sensations and gurgling are experienced from time to time; or there may be some soreness over the abdomen. Gastric symptoms are generally present, and the tongue is often abnormal. Owing to interference with digestion and nutrition, more or less wasting is commonly observed, as well as slight pyrexia in some cases, especially towards evening.

DIAGNOSIS.—The chief affections for which the various forms of acute intestinal inflammation are liable to be mistaken are simple diarrhœa, or diseases attended with this symptom, especially typhoid fever and dysentery; intestinal colic; peritonitis; painful affections of the abdominal walls; and, in the case of typhlitis and its consequences, local inflammation and abscesses in the right iliac fossa due to other causes, or certain tumors.

There can be no doubt but that many ordinary cases of diarrhoea are the result of catarrh, and it is often impossible to separate them. The characteristic symptoms of typhoid fever and dysentery are usually sufficiently distinctive. Simple colic is recognized by the characters of the pain; absence of fever; and presence of constipation. Peritonitis is readily separated from mere catarrhal inflammation by the intensity of the pain and tenderness, constipation, great constitutional disturbance, and other symptoms; but as regards severe localized enteritis, it is by no means easy to distinguish between them. Indeed, in most instances the peritoneum is involved along with the other coats, and this is more evident if the pain and tenderness are marked, superficial, and extensive. Colicky pains are suggestive of inflammation of the more internal portion of the walls. It is important to bear in mind duodenal catarrh as a not uncommon cause of jaundice.

In cases of chronic catarrh the main point to determine is whether this is simple; or associated with ulceration or amyloid degeneration. The special characters of ulceration will be presently indicated. Lardaceous disease of the bowels is almost always preceded by distinct clinical evidences of other organs being affected; as well as by the known causes of, and constitutional condition accompanying this morbid state.

PROGNOSIS.—Ordinary enteric catarrh usually ends favorably, but it may become chronic. If intense, however, or if it occurs in children, in very weak subjects, or as a complication of acute and chronic diseases, it may become highly dangerous and end fatally. The severe form of enteritis is extremely grave. Typhlitis is also necessarily attended with many dangers. Chronic catarrh, especially if long-established, is often very difficult to cure, and it adds to the gravity of other chronic diseases by interfering with the nutrition of the patient.

TREATMENT.—The remarks made with respect to diet in the case of stomach disorders apply with almost equal force to those affecting the intestines. In acute catarrh of the bowels, if there is anything causing irritation it is desirable to get rid of this by means of a dose of tincture of rhubarb, castor oil, or other simple aperient, or by an enema. As regards internal remedies, the most serviceable combination in my experience consists of bismuth, with alkalies, mucilage, and small doses of tincture of opium. An enema containing opium is also very useful after all irritant matters have been evacuated; and the various other remedies recommended for diarrhoea may be had recourse to if required. In duodenal catarrh it is necessary to give small doses of some saline aperient, such as sulphate with carbonate of magnesia, which may be preceded by a dose of calomel. External applications over the abdomen, especially heat and moisture, are often beneficial. Ordinarily there is certainly no necessity for removal of blood, but in the early stage of the more serious forms of inflammation it may be permissible

to apply a few leeches, provided the patient is in a fit condition. When the inflammation is accompanied with obstruction, the main points in treatment are to avoid giving purgatives; to administer opium freely, either by the mouth, enema, or subcutaneous injection of morphia; to support the patient, especially by enemata; and to treat the prominent symptoms, especially pain, nausea, vomiting, and tympanitis.

Typhilitis and its consequences need constant fomentation and poulticing; perhaps a few leeches in some cases; and opium internally. If an abscess forms, it should be encouraged towards the surface, and opened when the proper time arrives. If an accumulation can be felt in the cæcum, it may sometimes be squeezed out by gentle manipulation, but much care is necessary in practicing this.

Chronic enteritis will probably require some of the more powerful astringents alluded to under diarrhœa. Powders containing carbonate of bismuth, gr. v—x, with Dover's powder, gr. iij—vi, act very beneficially in some cases. Tincture of steel is also a valuable drug in this complaint when given in full doses. In obstinate cases counter-irritation over some part of the abdomen, especially the right iliac fossa, by means of blisters, iodine, or croton-oil liniment, may prove of service.

CHAPTER XXXVIII.

DYSENTERY—BLOODY FLUX.

ETIOLOGY.—Dysentery occurs as an acute and chronic disease, and may assume a sporadic or epidemic character. Different views are held as to its immediate exciting cause, viz.: 1. That it is due to a malarial poison, originating in vegetable decomposition and rising from the soil. 2. That though primarily originating in this manner, it may be afterwards propagated from one individual to another by means of a contagious specific poison, conveyed, as some suppose, only by the stools, especially through their being mixed with drinking-water; or, as others believe, by all the excretions and exhalations. 3. That it is independent of any specific poison, and merely results from certain general causes which tend to produce intestinal congestion and inflammation, such as exposure to cold, especially to night chills and dews; errors in diet, especially want or improper quality of food; excessive use of salt meat; drinking impure water or irritating liquors; indulgence in excess of or in sour fruit. Those who regard the malady as *specific* consider the causes just mentioned as merely *predisposing*, or as aiding in propagating the poison, but it is highly probable that they may at all events excite the sporadic form. Amongst other *predisposing* and *propagating*

causes are a hot and moist climate, especially during the seasons when the nights become chilly, most cases occurring in the autumn and particularly after much exposure to night air; overcrowding and filth; bad ventilation, especially with exposure to emanations from any kind of decomposing organic matter; and physical exhaustion. Dysentery may accompany or follow certain diseases, particularly ague or remittent fever, scurvy, relapsing fever, cholera, or syphilis, and also the state of system resulting from the action of prolonged heat. Ague and chronic dysentery were not uncommonly met with together in the case of sailors admitted under my care at the Liverpool Northern Hospital; and occasionally the latter complaint accompanied scurvy. Chronic dysentery always has its origin in the acute form.

ANATOMICAL CHARACTERS AND PATHOLOGY.—In general terms dysentery may be said to be characterized by inflammation of the large intestines, ending in ulceration or gangrene; with exudation on the mucous surface. According to the view entertained as to the origin of the disease is the inflammation considered by different authorities as simple or specific. Niemeyer regarded it as of a diphtheritic nature. So diverse have been the descriptions given of the morbid appearances, that it has been found necessary to start theories as to difference of type, etc., in order to explain the want of agreement, and it seems highly probable that the constitutional state of the patient will materially influence the characters of the disease.

Usually only a portion of the large bowel is involved, especially the rectum and neighboring part of the colon; sometimes the entire tract is affected, but the disease is then generally more advanced towards the lower end of the intestines. Occasionally it extends into the small intestines, even for a considerable distance, but this is usually observed only in scorbutic cases, or when patients are much debilitated.

In the early stages the chief appearances are considerable enlargement of the solitary glands (which has been regarded by most authorities as the primary lesion), and of the tubular glands; increased vascularization, varying much in extent and intensity, but being especially marked around the glands; with some swelling and softening of the mucous membrane. The solitary glands form little rounded projections, and in many a minute spot can be detected, corresponding to the orifice. They are filled with a whitish exudation, containing abundant young cells. Some consider these prominences as at all events partly due to exudation outside the glands, and affirm that these are not specially involved in dysentery. An exudation also forms in the intertubular tissues and on the surface of the mucous membrane, of a diphtheritic nature. It covers the membrane more or less extensively and thickly, sometimes being uniform, but usually granular, often presenting an appearance like bran or sawdust, and being most abundant on the tops of mucous folds. At first the color is grayish or yellowish-gray, but this is soon

liable to many alterations from various causes. The material is opaque, of some consistence, and can be detached, leaving a more or less red surface underneath or evidences of extravasation of blood. It appears to consist of a fibrinous substance, with abundant granules, nuclei, germs, epithelium cells and young nucleated cells, some of which are elongated and fusiform, resulting mainly from proliferation. Occasionally it undergoes a process of partial organization.

Ulceration appears chiefly to begin in connection with the enlarged glands, by a process of limited sloughing at the summit, the ulcer afterwards spreading. Sometimes, however, several glands with the intervening tissue are destroyed simultaneously; or the ulceration appears to be due occasionally to a process of disintegration of the exudation, involving at the same time the superficial part of the membrane. Very rarely it originates in submucous accumulation of pus or other materials. At the outset most of, but not all, the ulcers are small, circular, with rounded edges; by extension they become larger and irregular, often having a transverse direction, the margins being flattened, and the depth and appearance of the surface varying greatly, so that in time the ulcers are altogether wanting in uniformity. Not unfrequently the floor becomes covered with exudation. Now and then the coats are rapidly destroyed, so as to lead to perforation. Should the disease terminate favorably, and cicatrization ensue, this generally takes place with little or no puckering, the edges becoming rounded and adhering to the base of the ulcer, a layer of lymph then extending over the surface and becoming organized. Now and then healing is attended with much thickening, irregularity, induration, and contraction, leading to serious results. There is no fresh formation of glands in the cicatrix.

The rapidity with which the changes described take place in the course of a case of dysentery differs much. In very severe cases the entire mucous membrane of the large intestine is speedily converted into a slough. The affected part is generally dilated, and contains very offensive materials similar to those passed in the stools, including fragments of exudation and often blood.

When the small intestines are implicated, the appearances which they present are redness; exudation on the surface, sometimes extensive; enlargement or, rarely, ulceration of Peyer's and the solitary glands. The stomach may be more or less inflamed. The other morbid conditions observed in different cases associated with dysentery are enlargement, redness, and softening of the mesocolic glands, and, in some forms, of the mesenteric; serous inflammations, especially of the peritoneum, corresponding to the affected part of the bowel or due to perforation; hepatic derangements, particularly inflammation ending in abscess; enlargement of the pancreas and spleen, the latter being in rare instances the seat of abscess; renal disease, with destruction of

the epithelium; extensive bronchitis, lobular pneumonia, or pyæmic abscesses. The relation of hepatic abscess to dysentery has been much disputed. Some regard them as mere effects of the same cause, being independent of each other; others think the abscess is the consequence of the dysenteric ulceration, being produced by an extension of phlebitis, or, more probably, by the conveying of emboli and other deleterious substances. This complication seems to be much more common in hot climates.

When dysentery becomes chronic, the appearances presented are very diverse. Usually firm exudation forms between the coats, matting them together and causing much thickening and induration, so that the intestines feel very firm and solid, and pieces will sometimes stand on end. The color of the mucous surface alters, becoming dirty brownish-gray, or in parts black, on account of pigment derived from altered blood. The exudation undergoes a certain degree of organization, and often forms thick, warty, adherent masses. The surface presents in some cases a barklike aspect. Frequently, but by no means always, ulcers are observed, in every conceivable variety of stage and character, as well as cicatrices of former ulcers; some of these result from changes set up in the exudation, which extend into the tissue beneath. In some cases cicatricial bands and contractions alter greatly the calibre and form of the bowel, and sinuses may pervade its walls. In other instances there is extreme atrophy of the coats, including the glandular structures. An appearance of pseudo-ulceration may result from separation or cracking of the firm exudation, thus exposing the mucous surface, which is extremely red and irritable-looking.

SYMPTOMS.—Acute dysentery is presented in all grades of intensity, from a mild sporadic form to an epidemic of the most virulent type, but its symptoms are generally highly characteristic. Many cases, especially in temperate climates, begin with simple diarrhœa, slight colicky pains, thirst, loss of appetite, and some constitutional disturbance, the special symptoms setting in after a short interval; sometimes these are observed from the outset. A chill or rigor commonly ushers in the disease in severe cases.

The prominent local symptoms are gripping pains in the abdomen, technically named *tormina*, irregular in site, but chiefly felt along the colon; often a sense of heat or burning along the colon and rectum, or, in grave cases, over the whole abdomen; tenderness, especially in the left iliac fossa; more or less tympanitis; tenesmus, indicated by a sensation of fulness, weight, bearing-down, or of the presence of a foreign body about the lower end of the rectum, with frequent or constant desire to defecate, the act being accompanied with much straining; and the passage of peculiar stools. The morbid sensations differ greatly in their severity and constancy; in most cases they are paroxysmal, increasing until a stool is passed, by which they are temporarily relieved;

sometimes, however, they become constant and most agonizing. The tenesmus is more marked when the lower portion of the rectum is implicated. At first the stools are often semi-feculent or consist of hard scybalaë, but they soon assume the dysenteric characters, becoming scanty, slimy, or gelatinous from the presence of mucus, bloody, with a most offensive and characteristic odor. Usually the different matters are more or less mixed, the more so the higher the disease is situated, when they also contain abundant depraved biliary secretions. If the rectum is chiefly affected the blood is less intimately incorporated, while the stools are more muciform (Macleay). Not uncommonly scybalaë are passed from time to time, covered with mucus and blood. Mild cases do not go beyond this, but in bad forms of the disease in tropical countries the stools change in their characters, becoming muddy-looking, brownish, brownish-red, or even black; often watery and copious, and containing shreds or masses of membrane, which look like "washed raw meat." Sometimes a large quantity of pure blood is passed, or sloughs of the mucous membrane. At this time the odor becomes intolerable, and it has been compared to carrion, or to the "smell of a macerating tub in a dissecting-room." Dr. Goodeve has recommended that the stools should be washed with water, so as to leave nothing behind but the sediment, which contains the products of the intestinal disease, and these can then be examined, and the condition of the bowel be thus more accurately determined. Chemically the stools yield a large proportion of albumen, even when there is little or no visible blood. They are alkaline, and contain much carbonate of ammonia. Microscopically they present abundant epithelium-cells, blood, exudation- and pus-cells, and remnants of the membrane. Peculiar cells and other bodies have been described.

There are other indications of digestive disturbances in the way of anorexia; thirst, which may be intense; furred tongue; and sometimes nausea and vomiting. There may be irritability of the bladder, with strangury; or, on the other hand, paralysis with retention when the rectum is much affected. The urine is generally high-colored, scanty, and prone to rapid decomposition; in low forms it becomes very offensive; occasionally it is suppressed. In females irritation of the vagina is complained of in some cases.

The constitutional symptoms in the less severe cases are only those indicative of slight pyrexia. In the graver forms these are more marked, there being at the same time much nervous depression and irritability, with an anxious, distressed expression of countenance. When tending towards a fatal issue, and in the most severe types of the disease almost from the first, the symptoms assume an adynamic or typhoid character, with great prostration, the tongue becoming red, dry, brown, or blackish, with sordes on the teeth; the pulse very rapid, feeble, or irregular; while the tympanitis increases; the painful sensations cease; there is

persistent hiccough; and low nervous symptoms set in, ending in coma. In the malignant type of dysentery speedy collapse occurs, resembling that of cholera, with hæmorrhage from the mouth and nose.

VARIETIES.—Several varieties of acute dysentery have been described, according to the severity and nature of the symptoms present, and the other conditions with which it is associated. The chief are named mild; asthenic; asthenic or typhoid; bilious; malarious, characterized by the periodicity of the febrile paroxysms, much gastric irritability, the serous character of the stools from the first, which contain but little blood, the greater frequency of hepatic complications, and the efficiency of quinine in treatment (Maclean); malignant; scorbutic.

DURATION AND TERMINATIONS.—Dysentery lasts a very variable time, and it may terminate in death or recovery, or become chronic. Death may happen within two days, or not for two or three weeks or more; it results either from collapse, the typhoid state, gradual exhaustion in prolonged cases, hæmorrhage, or occasionally perforation. A favorable turn is indicated by the stools becoming feculent and losing their dysenteric characters; cessation of the painful sensations; diminution of fever; and improvement in strength, in the state of the pulse, and in the expression.

CHRONIC DYSENTERY is a most troublesome complaint, but the precise symptoms do not entirely depend upon the state of the bowels, being often modified by some constitutional diathesis, or by a diseased condition of some other organ. The tenesmus and other morbid sensations are less marked than in the acute form, or may be absent. In some cases control over the sphincter ani becomes completely lost. The stools differ considerably in characters, even in the same case from time to time; they may be formed, but covered with mucus or blood; usually, however, they are more or less liquid, presenting a mucous, serous, or bloody appearance, mixed with feces; sometimes they are reddish-brown, pale and frothy, muco-purulent, or actually purulent. The peculiar odor is retained more or less, and may be very intense. Appetite varies much; the tongue is often red, glazed, or fissured. The general system necessarily suffers considerably, as evidenced by emaciation; anæmia or a sallow and cachectic aspect; shrunken features, with a distressed, weary, or aged expression; sense of weakness and exhaustion; pyrexia, tending towards the hectic type with night-sweats; and loss of hair. Death often results from gradual asthenia.

DIAGNOSIS.—The symptoms of dysentery just described are quite characteristic, and an examination of the stools, combined with the sensations of the patient, and the general symptoms, ought to leave no doubt as to the nature of the case. All authorities lay much stress on the peculiar odor of the evacuations. The fact of the disease being epidemic is also of service in diagnosis. Dysenteric symptoms may set in in cases of long-continued intestinal catarrh, which might then

be mistaken for true dysentery. I have also known a case of cancer of the rectum simulate chronic dysentery.

PROGNOSIS.—This will depend upon whether the disease is sporadic or epidemic; the severity of the attack; the characters of the stools; the general condition of the patient; the progress of the case; and the presence or absence of serious complications, especially hepatic. Epidemic dysentery, particularly when of a low type, is extremely fatal. Signs of collapse or adynamia are of course very unfavorable, and among specially bad signs are mentioned gangrenous stools; severe hæmorrhage; subsidence of the pain while the other symptoms are becoming worse; and suppression of urine. An early return of the evacuations to their normal state is highly favorable. Chronic dysentery may often be improved by appropriate management, as I found from a tolerably extensive experience of this disease at the Liverpool Northern Hospital. Prolonged cases, however, are not much amenable to any treatment.

TREATMENT.—Early attention is of extreme importance in acute dysentery, and the patient should immediately take to bed. In the sporadic form resulting from a chill, some authorities advocate the use of a warm, vapor, or hot-air bath at the outset. In some cases also a little castor oil with laudanum is beneficial at first. The remedy, however, in this disease, and one which seems to have almost a specific action, is ipecacuanha in full doses. Several gentlemen who have had much experience of dysentery in India have personally informed me of the marvellous effects of this drug. Dr. Maclean recommends the following plan of administration: To give grs. 25 to 30 of the powder in a small quantity of fluid, with a little syrup of orange-peel; after which the patient must keep perfectly quiet, and take no fluid for at least three hours, if thirsty being allowed to suck a little ice occasionally. In from eight to ten hours a smaller dose may be given, this depending on the effect of the first, and the urgency of the symptoms, by which also the subsequent repetition of the drug must be guided, and it may be required for some days. It is well to administer 10 or 12 grains at bedtime for a night or two after the stools appear healthy. Some authorities recommend it to be administered more frequently in smaller quantities; and others employ $3\frac{1}{2}$ to $3j$ every four or five hours, but these large doses seem unnecessary, and are liable to produce much depression. It has also been advocated to introduce ipecacuanha by enema, but this is objectionable. Many consider it desirable to make the stomach tolerant of the medicine beforehand, by means of a full dose of laudanum or Battley's solution, or a few drops of chloroform; or by applying anodyne poultices over the epigastrium. Perhaps a small subcutaneous injection of morphia might answer this purpose. Dr. Maclean states, however, that frequently no sedative is required, and that

if vomiting is unmanageable after ipecacuanha, hepatic complication or overcharging of the system with malaria should be suspected.

Local applications over the abdomen are very useful, especially warm poultices; fomentations sprinkled with turpentine, laudanum, or chloroform; and sinapisms. Symptomatic treatment is often required. The above applications will usually afford relief to the painful sensations, but if the tenesmus is very severe, warm emollient enemata or a suppository of opium may be tried. Of course diet requires the utmost attention. Beef tea, soups, arrowroot, sago, raw white of egg, jellies, and such articles, should be given in small quantities between the periods of administration of the ipecacuanha. Stimulants are to be avoided generally, but in the typhoid condition they are certainly required. As the patient improves, so must the food be cautiously altered. Hygienic measures also demand every care, especially as regards the immediate disinfection and destruction of the evacuations.

The evidence in favor of the treatment thus far considered seems quite conclusive; but in a treatise of this kind it is necessary to mention the other chief methods advocated. These are—1. By astringents, especially opium. These are useful if diarrhœa holds on after the stools have lost their dysenteric characters. 2. By purgatives, such as castor oil, sulphate of magnesia, or cream of tartar. 3. By venesection and calomel. Calomel has been given in large quantities; or in doses of gr. i to gr. ii with opium every three or four hours. This treatment had better be avoided, and the only removal of blood which seems justifiable is by the application of a few leeches in the left iliac fossa, should the pain be very intense and the state of the patient be favorable. 4. By a combination of blue pill, opium, and ipecacuanha. 5. By antiseptics. It is important to note that there are two forms of dysentery which require a modification of treatment, viz., the malarious and the scorbutic. The former calls for full doses of quinine, alternating with the ipecacuanha; the latter for fresh fruits, and Maclean and others recommend Bael very highly in these cases.

In the management of chronic dysentery the most essential matters are to regulate the diet; and attend to sanitary measures for improving the health. Mr. Harry Leach has found from his experience at the Dreadnought Hospital that rest for the bowels and body, with a bland nutritious diet, are mainly to be relied upon for a cure, and he considers that drugs are of little or no use. Certainly I think I have seen much benefit follow the administration of Dover's powder, gr. iv—v three or four times daily; and still more from full doses of tincture of steel during the day, with a little Dover's powder night and morning. Dr. Reginald Thompson found ipecacuanha (gr. iij—v every 3 hours) most serviceable. The stronger astringents, such as gallic acid, acetate of lead, sulphate of copper, or nitrate of silver are often employed, but they have never been of much permanent service in my experience.

Small doses of bichloride of mercury have also been recommended. A dose of castor oil with a little opium may be taken from time to time. Opium enemata are sometimes beneficial, especially for relieving unpleasant sensations. Other measures recommended for this purpose are the use of a water compress over the anus, or gentle douching of this part; wearing a bandage or a water-belt over the abdomen; friction over the abdomen with anodyne or irritant liniments; or the application of a blister over the left iliac fossa. Among the hygienic matters needing special attention are change of air, particularly speedy removal from a malarial district, or from a tropical country to Europe; the wearing of warm clothing; and the use of cold baths with friction afterwards, if they are well borne. Some employ baths containing dilute nitro-hydrochloric acid. If there is any malarial, scorbutic, or other morbid condition of the system, the treatment must be modified accordingly. Any acute or subacute exacerbation of symptoms calls for complete rest and the immediate administration of ipecacuanha.

CHAPTER XXXIX.

INTESTINAL NEW FORMATIONS AND ULCERATIONS.

It appears desirable to give a summary of the morbid conditions coming under the above headings, with some general remarks on their clinical features; and to consider briefly such of the more important of them as have not yet been noticed. The reason for treating new formations and ulcerations together is that the former often originate the latter.

NEW FORMATIONS.—These include: 1. Cancer. 2. Tubercle and other materials formed in the so-called tubercular disease. 3. Typhoid deposit. 4. Albuminoid infiltration. 5. Occasionally fibroid infiltration. 6. Rarely villous growths; polypi; adipose, cystic, erectile or glandular tumors; and calcareous deposits. The immediate symptoms due to these, if any, are either indicative of obstruction of the bowel; or of irritation and catarrh of its mucous membrane. Local pain and tenderness may or may not be complained of. Frequently there are constitutional symptoms, or symptoms associated with other organs, which aid in determining the nature of the disease. In some cases *physical examination* may detect a growth.

ULCERATIONS.—The ulcers met with in the intestines may be thus arranged: I. *Non-specific*. 1. Those due to direct injury of the mucous surface by foreign bodies, calculi, hardened feces, and chemical destructive agents, including probably acrid secretions. 2. Those originating

in inflammation. Simple catarrh, especially if of long duration, may end in ulceration, either catarrhal or follicular. The separation of croupous or diphtheritic deposit may also cause it. Rarely it results from submucous suppuration or gangrene. 3. Perforating ulcer. An ulcer similar to the gastric variety is now and then observed in the duodenum. The form associated with burns and scalds also needs to be mentioned. 4. Ulceration from some morbid condition outside the bowel making its way into the interior, which is very rare.

II. *Specific.* 1. Typhoid. 2. Tubercular. 3. Dysenteric. 4. Cancerous. 5. Syphilitic probably. 6. Ulcers due to albuminoid disease.

SYMPTOMS.—The local symptoms suggestive of ulceration of the bowels are constant colicky pains; localized tenderness, especially if the disease is extensive or if the large intestine is involved; and persistent diarrhœa, the stools often having very unhealthy characters, sometimes resembling pea soup or gruel, and being unusually fetid, or containing blood, mucus, or pus. Cases come under observation, however, in which constipation is the only conspicuous symptom. If the disease is limited to the small intestines, especially their upper part, the diarrhœa is of a simple kind; and it is usually only in such a case that constipation is observed. If the large bowel is much implicated, especially the rectum, the symptoms tend to be dysenteric. The diarrhœa is chiefly due to catarrh set up by the ulceration. The circumstances under which this occurs will generally aid much in indicating the event, as in typhoid fever, dysentery, or phthisis. When chronic, it is in some instances very difficult to make out positively that there is ulceration, and to distinguish this morbid condition from mere chronic catarrh, but it may be strongly suspected should there be diarrhœa, either constant or easily excited, or not amenable to treatment, especially if the stools are very unhealthy. The constitutional condition often affords aid in diagnosis. Ulceration itself tends to excite more or less pyrexia, which in chronic cases is frequently of a hectic type; and also leads to impaired nutrition, inducing emaciation, debility, and anæmia. It may cause peritonitis, perforation, or serious hæmorrhage; or stricture may result from cicatrization.

TREATMENT.—It needs scarcely be remarked that attention to diet is all-important in treating ulceration of the bowels. At the same time it must be so ordered as to promote the nutrition of the patient, and to be adapted for any morbid diathesis present. Rest of the body is highly beneficial, and of course the affected part should be kept as quiet as possible. This object is best gained by administering opium in some form, if it is admissible; if not, other sedatives must be given, especially belladonna. Diarrhœa must be controlled by the various astringents along with opium. The chief remedies which are believed directly to promote the healing of ulcers are nitrate of silver, sulphate of copper, acetate of lead, oxide of zinc, and bismuth salts. Much benefit often

follows the use of carbonate of bismuth with Dover's powder in the ulceration which occurs during phthisis, as well as in other forms. It is not desirable to encourage long-continued constipation, but should this symptom be present, much care is necessary in the employment of aperients, which must be of the mildest kind; simple enemata are very useful. Tonics are often indicated, especially preparations of iron. It is well for the patient to wear a warm bandage round the abdomen, properly applied. Local applications may be required from time to time. Some recommend an occasional blister over the right iliac fossa.

CANCER OF THE INTESTINES.

ANATOMICAL CHARACTERS.—Primary cancer of the intestines is very rare, and when the bowel is involved, which is not common, it is generally by extension, especially from the peritoneum and subperitoneal tissue, though even then the muscular and mucous coats often escape. The large intestines, particularly the rectum and sigmoid flexure, are far more frequently attacked than the small, of which the duodenum is the part usually implicated. All varieties are met with, even melanosis, but scirrhus is the ordinary form. Epithelioma has in rare instances invaded the rectum by extension from the uterus and vagina. Sometimes encephaloid arises on a basis of scirrhus, when the latter reaches the interior of the bowel.

There are the usual variations in the characters, arrangement, and extent of the cancer. It may be limited to one part, occasionally forming a rounded or lobulated tumor; widely spread; or in scattered nodules, which are often secondary to some more localized and extensive deposit. In the progress of the disease the coats become matted together, and ultimately, if the mucous membrane is implicated, ulceration or sloughing ensues, the ulcer being either smooth and excavated, with thickened, indurated, and tolerably regular edges; or presenting an irregular aspect, with fungous growths along the floor and margins, often very vascular, and liable to bleed freely. Perforation may take place, not uncommonly into some hollow organ. Frequently the affected part of the intestine is much constricted, while the part above is dilated and its muscular coat hypertrophied, the portion beyond being contracted.

SYMPTOMS.—The following are the clinical phenomena to be looked for as indicative of cancer of the bowels: localized pain in some part of the abdomen, either constant or at intervals, dull and aching or lancinating, with tenderness; habitual constipation, with abnormal shape and size of the stools, ultimately culminating in complete obstruction; the physical signs of a tumor deep in the abdomen, hard, irregular, and tender, at first movable, but afterwards fixed; with marked and rapid wasting and loss of strength, as well as signs of the cancerous cachexia,

or of cancer in other parts. In some instances, however, there is diarrhoea, especially after ulceration sets in, when the stools become extremely offensive, and occasionally symptoms of obstruction disappear, owing to a mass of cancer sloughing or ulcerating away. When the rectum is affected, the pain is referred to the sacrum, shooting thence towards the thighs and back, being often extremely severe. Symptoms of a dysenteric character are then also generally complained of. Examination per rectum may reveal the disease. Cancer is liable to give rise to abundant hæmorrhage; or it may lead to intestinal perforation, or to extensive destruction of neighboring organs. Death is usually gradual, but may be hastened by complete obstruction, perforation, peritonitis, or hæmorrhage.

TREATMENT.—Usually all that can be done is to treat symptoms. In some instances life may be prolonged by making an opening into the bowel above the seat of the disease, if this is low down.

TUBERCLE OF THE INTESTINES—TUBERCULAR ULCERATION— SCROFULOUS DISEASE OF THE INTESTINES.

ETIOLOGY AND PATHOLOGY.—There are the same differences of opinion as to the pathology of the so-called tubercular disease and ulceration of the intestines, as in the case of other affections of this class. Some explain all the phenomena by the formation of tubercle, and its subsequent destruction with that of the involved tissues. Others consider that true tubercle is but rarely formed, and that the appearances are usually due to the proliferation of cells in the glands, which become caseous and break down, ultimately destroying the overlying membrane and forming ulcers, which spread by further cell-formation and disintegration in the surrounding mucous and submucous tissues. Niemeyer acknowledged that secondary tubercle is met with sometimes in the immediate vicinity of ulcers, especially in the peritoneum corresponding to these, but believed that as a primary condition it is extremely rare.

It certainly is most difficult to determine what is tubercle and what is not in the intestines. Niemeyer stated that it would be best recognized by its being deposited in separate nodules or groups where there are no Peyer's patches.

As a localized affection, implicating at the same time the mesenteric glands, this complaint is by far most frequent in scrofulous children; in adults it almost always occurs secondarily to pulmonary phthisis.

ANATOMICAL CHARACTERS.—In the great majority of cases the solitary and Peyer's glands are chiefly implicated, and hence the morbid appearances are observed in the lower portion of the small intestines, or are most advanced there, while they gradually cease towards the jejunum. Occasionally they extend into this portion, or very rarely even to the duodenum. Not uncommonly the cæcum, appendix vermi-

formis, and colon are involved, to which sometimes the disease is chiefly or entirely limited. The area affected varies greatly, and generally the morbid changes are visible in different stages in different parts. At first little firm, gray, projecting nodules are seen, which become yellow and soften and break down, producing small circular ulcers. Apart from their situation, it appears impossible to distinguish between the granulations of tubercle and those due to enlarged glands. The ulcers soon become larger, however, either by infiltration and destruction around, invading tissues far beyond the glands, or by coalescence, and they come to present special characters, in which condition they are generally seen. These characters are more or less irregularity in shape; a transverse direction as regards the bowel, the ulcer spreading mainly in the course of the vessels, and sometimes completely surrounding the gut with a band of ulceration $\frac{1}{2}$ to 1 inch or more wide; thickening, irregularity, and induration of the margins and floor, the latter presenting nodules; and but little proneness to heal. Imperfect or partial cicatrization is, however, often observed, with the formation of a dense tissue, sometimes pigmented, the edges being drawn together, and thus contraction and irregularity of the gut is produced, or rarely complete stricture.

During the process of ulceration local peritonitis is set up, causing thickening and adhesions, and thus all the coats are frequently destroyed without the occurrence of any symptoms of perforation, or sometimes a communication is formed between two portions of the intestines. Secondary tubercles are often observed in the affected portion of the peritoneum, which may spread along the lymphatics to the mesentery. The floor of the ulcers not uncommonly presents evidences of hæmorrhage. Niemeyer stated that true tubercular ulcers are not so extensive as those of non-tubercular origin.

SYMPTOMS.—Tubercular disease of the bowels is indicated in the child by the occurrence of persistent or frequent symptoms of intestinal irritation and catarrh; associated with the general symptoms of tuberculosis, much wasting, and retarded development. In the adult ulceration may be suspected if in the course of phthisis the symptoms characteristic of this condition arise, especially if diarrhœa sets in which will not yield to proper treatment, and if there is localized tenderness; but it is in these cases that constipation is most frequently observed, this being sometimes due to peritonitis, while on the other hand diarrhœa is often dependent upon other causes.

TREATMENT has been sufficiently indicated when speaking of ulceration in general.

ALBUMINOID INFILTRATION.

ANATOMICAL CHARACTERS.—The entire alimentary canal may become the seat of albuminoid disease. In the intestines it begins in the small

vessels of the villi, and then spreads to the other vessels; in time it involves the glands, the entire villi, and ultimately the whole of the mucous coat, or even the submucous and muscular coats. Extensive atrophy of the villi may follow. The morbid material is liable to undergo disintegration, forming a yellow substance; and finally small ulcers are sometimes formed, corresponding to the glands. It is very difficult in the early stages to recognize this morbid condition. The surface appears pale, anæmic, and glistening or shining, but the iodine test is necessary to reveal the deposit, which it shows to be in the villi and small vessels. In more advanced cases the appearances are more characteristic, and enlarged glands or ulcers are seen, especially corresponding to Peyer's or the solitary glands. Peyer's patches sometimes present a reticulated aspect.

SYMPTOMS.—Should there be evidences of albuminoid disease of other organs, the same condition of the alimentary canal may be fairly diagnosed, if obstinate diarrhœa should set in, with liquid stools, especially if these are greenish or otherwise unhealthy. Hæmorrhage is liable to occur in the later stages, and it may be quite independent of ulceration. Implication of the stomach is indicated by persistent vomiting, with signs of imperfect digestion. When the alimentary canal is affected with albuminoid disease, nutrition is necessarily gravely interfered with.

TREATMENT.—The treatment is that required for albuminoid disease in general, and for gastric or intestinal catarrh and ulceration.

CHAPTER XL.

INTESTINAL OBSTRUCTION.

ETIOLOGY AND PATHOLOGY.—The numerous causes of obstruction of the bowels may be ranged under certain heads, viz.: 1. Accumulations in their interior, of hard faeces; indigestible matters, either taken in the food, such as oat-cakes, rice, seeds or stones of fruits, or swallowed purposely, especially by hysterical girls and children, *e. g.*, string, hair, dirt, sand; certain medicines which are apt to form concretions if taken for some time in quantity, viz., magnesia and sequioxide of iron; masses of worms; large or numerous agglomerated gallstones; concretions of phosphate or carbonate of lime. Gallstones usually lodge high up in the small intestines. 2. Stricture resulting from morbid changes in the coats of the bowels, viz.: *a.* Congenital constriction, chiefly about the anus, rarely in the duodenum. *b.* Cicatrization of an ulcer, especially if this has passed round the gut, or has been

very extensive. *c.* Fibroid infiltration of the walls. *d.* Cancer. This class of causes is by far most common in connection with the large intestines. 3. Compression, constriction, or traction due to morbid conditions external to the intestines. Dr. Hilton Fagge has drawn particular attention to some of these causes, which include pressure by displaced or enlarged organs and tumors of various kinds, particularly in connection with the uterus and ovaries; by growths or accumulations in the intestine itself; or by certain adhesions, agglutinations, or deposits in the peritoneum, sometimes after simple peritonitis, but more frequently associated with tubercle or cancer. These latter may lead to distinct constriction, or may cause a sudden bend or twist in the intestines; but usually they merely impede the peristaltic action, either by compressing the bowel somewhat for a considerable extent, binding it down, exerting traction upon it, or matting together several coils. Hence materials collect above, which press upon the portion below, ultimately inducing complete obstruction; this is frequently aided by a certain degree of spasm. These causes mainly affect the small intestines. 4. Strangulation or incarceration, either external or internal. Under this group come the different forms of hernia, not forgetting the rarer varieties. Internal strangulation in rare instances results from the passage of a portion of intestine into some normal opening, especially the foramen of Winslow; or into a perforation in one of the folds of the peritoneum, *e. g.*, the omentum or mesentery. Generally, however, it is due to peritoneal bands of adhesion passing between different parts; or to the vermiform appendix or diverticula connected with the ileum becoming adherent at their free ends. Very exceptionally one portion of the bowel is strangulated by another portion; by the mesentery; or by its entrance into a rupture in the intestine or some other hollow viscus. 5. Altered relation of portions of the bowel or of the intestinal coats. The important form of obstruction coming under this head is *intussusception*, *invagination*, or *volvulus*, in which one portion of the intestine is prolapsed into that next below. Another variety is named *torsion* or *rotation*, in which the bowel with its attached mesentery is twisted, though Dr. Bristowe considers that this twisting is in many cases not the cause of obstruction, but the effect of enteritis, which has been the primary mischief. *Prolapsus ani* also ranges under this group, though it scarcely ever leads to complete obstruction. As very rare conditions have been mentioned sacculation of a part of the bowel; and hernia of the mucous membrane through the other coats. 6. Spasm or paralysis of the muscular coat. Either of these conditions may aid in inducing obstruction; or now and then possibly it may be the sole cause.

With regard to the determining cause of intussusception a few remarks are necessary. It depends upon the peristaltic action of the intestines, and is supposed to be chiefly the consequence of undue dila-

tation of a portion of bowel towards which the wave of contraction is advancing, from accumulation of gas or any other cause; and to this portion being fixed, so that the part above is driven into it by its own contraction. In many cases some violent exertion in which the muscles of the abdominal walls partake determines the occurrence of intussusception. It has also been stated to be originated by worms or polypi, and to be frequent in connection with chronic diarrhœa. Once it has started, the invagination increases by the continuance of the peristaltic action, by which more bowel is driven in from above, at the same time the outer tube of intestine being inverted. Some of the other forms of sudden obstruction may be also immediately caused by violent effort.

Sex and age require notice as important predisposing causes of certain varieties of obstruction. That resulting from impaction of gall-stones is by far most frequent late in life and in females. Strictures are more common in males, and after middle life. Internal strangulation does not often occur under 30 years of age, except that form due to adhesions of the appendix vermiformis or of diverticula, which is observed in young persons most frequently, and chiefly in males. Ileo-cæcal intussusception is remarkable for its frequency in children, but in the ileum or jejunum it is almost limited to adults; on the whole it is twice more common among males.

ANATOMICAL CHARACTERS.—The appearances met with after death in cases of intestinal obstruction necessarily vary much according to the condition upon which it depends. Only *intussusception* calls for special description. By far the most common form of invagination is that in which the ileo-cæcal orifice descends into the cæcum, and then passes on into the colon, bringing down more and more of the ileum. It is not very uncommon in the ileum or colon, but is rarely observed in the jejunum or rectum. Very exceptionally the end of the ileum passes through the ileo-cæcal opening, the lips of the latter not being displaced. The portion of intestine which is the seat of invagination presents three layers, arranged concentrically; the most internal is the part which has descended, the outer one is the sheath or intussusciptions, and the middle layer unites these, being derived from the continued involution of the sheath, and its surfaces are necessarily reversed, so that its serous coat is in contact with that of the internal layer, and its mucous coat with that of the external, while the mesentery belonging to the middle and internal layers is drawn in and lies between them. This exercises unilateral traction, whereby the intussuscepted portion is curved, with the concavity towards the involved mesentery, and its lower opening looks towards some part of the wall of the outer tube, being elongated and fissure-like. The affected portions of bowel are more or less convoluted or twisted, especially the middle layer.

The extent of the invagination varies considerably, ranging from an

inch or two to three or four feet or even much more than this, especially in the ileo-cæcal variety; not uncommonly short intussusceptions are found in the small intestine after death, which are easily reduced, and have given rise to no symptoms during life; some believe that these are originated during the act of dying, or even post-mortem. In the great majority of cases, however long the intussuscepted portion may be, its lower end continues the same as at the commencement. Ultimately it may reach the anus or even protrude through this.

Certain important events are liable to happen in connection with the invaginated portion of intestine. 1. Of course the inner layers are more or less compressed by the outer tube, especially at the entrance or neck of the invagination; the canal is therefore narrowed, but not usually completely closed at first. 2. The return of blood is interfered with, and hence results mechanical congestion, often intense, leading to œdema of the tissues, or even escape of blood between the mucous surfaces or into the intestinal canal, where it is mixed with serum; consequently thickening and swelling arise, which increase the obstruction. 3. Soon peritonitis is set up over the contiguous surfaces of the serous coat, with exudation of lymph, and this may spread and become general, or the formation of adhesions may limit the further descent of intestine. 4. Violent enteritis is excited, and ultimately, owing to this condition and the congestion, gangrene not uncommonly results. 5. In some cases the mortified portion becomes detached, either completely or in part, and either in one mass or in fragments, and is expelled per anum. The dangers of this separation may be prevented by adhesions having formed between the top of the outer tube and the intestine above; but if these are not sufficiently firm, the structures give way, with the escape of the intestinal contents into the peritoneum. If the bowel is expelled and adhesions are complete, recovery may follow, but there is still a further danger of a stricture forming at the point of union; or sometimes only a part of the invaginated bowel comes away, while the upper portion remains and becomes adherent to the surrounding tube, and thus there is more or less permanent obstruction. The rapidity with which the changes above described are set up depends on the severity of the compression, and therefore upon the part of the bowel involved. They are much more rapid in connection with the small intestines than the large, but especially when the ileum passes through the ileo-cæcal orifice without disturbing it.

The portion of intestine above that which is intussuscepted acts with undue vigor and thus aggravates the mischief, while at the same time it drives on some of the contents of the bowel. For a time also the affected part itself contracts. By the pressure of its lower end against the wall of the outer sheath, ulceration of the mucous surface is often excited. Very rarely double intussusception has been observed.

Any sudden constriction will necessarily lead to congestion of the

bowel and its consequences; inflammation, involving also the peritoneum; and ultimately to gangrene and perforation if the constriction is not relieved. In prolonged cases the part of intestine above an obstruction becomes much dilated, elongated, and hypertrophied, though these appearances are not always most marked directly above the impediment, while feces and other matters accumulate, giving rise to catarrh or ulceration; the distal portion is contracted, empty, and atrophied.

SYMPTOMS.—The direct clinical phenomena which in the first instance indicate complete obstruction of the bowel, from whatever cause, may be stated generally as absolute constipation, usually accompanied with colicky pains, often severe; increased peristaltic movements of the intestines; abundant formation of gas, leading to tympanitis and borborygmi; nausea and vomiting, the latter ultimately becoming stercoraceous or fecal. Not uncommonly physical examination of the abdomen and rectum reveals some abnormal condition. In many cases symptoms indicative of severe enteritis, peritonitis, or perforation are subsequently developed. There are some circumstances which have an important influence on the clinical history of obstruction, especially the pathological conditions to which it is due; and its seat. Practically cases may be divided into two classes, viz., 1. Those in which the obstruction is gradual; 2. Those in which it occurs suddenly. In the former class of cases there will have been constipation for a variable period, sometimes alternating with diarrhœa, often with alteration in the shape and size of the solid stools; colicky pains; nausea and vomiting from time to time, and other digestive disturbances; with perhaps occasional signs of complete temporary closure of the bowels; or there may be physical signs of some mechanical obstruction. These cases may terminate slowly by asthenia; or culminate in a sudden attack of absolute stoppage of the bowels. The pain associated with obstruction is at first of a griping character, in some forms being sudden and severe, frequently starting from about the umbilicus, but it may radiate from some other locality which corresponds to the seat of the disease; after a time peritonitic pain not uncommonly supervenes. Absolute constipation is not an invariable symptom, for when the small intestine is implicated, its liquid contents can pass along unless there is complete closure, and the same thing may happen when intussusception affects the large intestine; further, feces contained in the bowels below an obstruction are often expelled. Occasionally blood and mucus are discharged, especially in invagination of the large bowel. Vomiting is more easily excited and more severe the nearer the stoppage is to the stomach. At first it is sympathetic in most cases, but soon the rejected matters have a distinctly fecal odor, and present an appearance like pea-soup, consisting of materials which have either flowed back into the stomach from the bowels, or been forced by anti-peristaltic action or by external

pressure. In some instances there is more or less suppression of urine, especially if the obstruction is high up, which is most probably a sympathetic derangement.

DIAGNOSIS.—The further elucidation of the clinical history of these cases will be best aided by considering the points on which a diagnosis is founded. This has to determine, first, the existence of an obstruction and its cause; secondly, its situation.

In conducting the examination the following course may be adopted:

1. The age and sex should be noted, the influence of these as predisposing causes of different varieties of obstruction being borne in mind.
2. Certain questions in the past history of the patient should be specially inquired into, viz., whether articles have been taken, either in the diet or in any other way, which might form concretions in the bowels; the habitual state of the bowels; and if there is any history of previous intestinal ulceration, peritonitis, passage of gall-stones, or of uterine displacement or other condition which might give rise to pressure.
3. Any peculiar constitutional condition must be observed, and this may afford some aid, as, for instance, by indicating the cancerous cachexia; phthisis, which is liable to be attended with ulceration and its consequences, or tubercular peritonitis; chronic dysentery; or hysteria, in connection with which accumulations of fæces are common, and possibly paralysis may occur.
4. As regards the history of the attack itself, it should be ascertained whether it has been gradual or sudden in its onset, and how long it has lasted; if the former, what the state of the bowels has been, if any peculiar alteration in the stools has been observed, or if there have been previous attacks of complete obstruction which have yielded to treatment; if the latter, whether the attack can be traced to anything having been swallowed, or to any sudden effort or other cause, and if it has commenced with severe localized pain.
5. The precise local and general symptoms must of course be carefully noted, whether as indicating simple obstruction, partial or complete; or in addition enteritis or peritonitis; and also the rapidity with which stercoraceous vomiting sets in.
6. Careful *physical examination* is essential.
 - a.* All forms of hernia must be thoroughly sought after.
 - b.* Any contraction or distension of the abdomen, either general or local, must be noted, a view being also taken from behind; in the early stages this may help much in fixing upon the seat of any obstruction.
 - c.* The situation may also be partly determined in some cases by observing the situation of any violent peristaltic movements in the intestines.
 - d.* Among the more important conditions discoverable by satisfactory investigation of the abdomen, which may also point to the situation of a stricture, are accumulations, including impacted gallstones, the onward progress of which can occasionally be traced; tumors of various kinds, either external to or associated with the intestines; and intussusception. It must be re-

marked, however, that even when these conditions exist, it is for many reasons frequently difficult or impossible to detect them. *e.* Examination per rectum by the finger, hand, or bougie, is often most serviceable. The amount of fluid or air which can be injected per anum has been stated, especially by the late Dr. Brinton, to aid materially in fixing upon the seat of any stoppage, but this must be by no means implicitly relied upon. *f.* Of course, should anything be vomited or passed by stool, the materials thus discharged should be properly examined. 7. In any doubtful case it is necessary to watch the progress as regards its clinical course, rapidity, and termination, and this may soon afford considerable assistance in diagnosis.

Having given this outline of the method of investigation to be pursued, it will be well to add a brief summary of the chief clinical features of each class of cases of obstruction.

1. Accumulations are generally gradual in their progress, but in some instances, especially when due to gallstones, the symptoms are very sudden. The physical signs and consequences of most of these collections have been already considered in a former chapter; and here it need only be remarked that impacted gallstones are particularly liable to set up violent enteritis, while the course of these cases is usually very rapid. 2. Strictures and compressions of the bowel may be considered together. They are usually chronic in their progress, complete obstruction being preceded by gradually increasing constipation, sometimes interrupted by attacks of diarrhœa; diminution in size and change in shape of the stools, should a stricture be near the end of the intestines; liability to colicky pains, sickness, and other digestive disturbances, and interference with nutrition. From time to time, also, there may be signs of temporary complete obstruction. There may be a history of some cause; or physical signs may be detected, indicating some morbid condition likely to give rise to stricture or compression. Commonly these cases linger a long while, even after there is absolute closure of the bowels. Now and then, however, symptoms of obstruction come on suddenly without any particular previous symptoms, followed by enteritis or peritonitis. Possibly some accumulation above the stricture may then be the immediate cause of the symptoms. 3. Strangulations give rise to rapid and absolute obstruction; followed speedily by signs of severe enteritis, or even gangrene of the intestines, perforation, and peritonitis. If not relieved their issue is quickly fatal. Many of these cases can only be determined by exclusion, and frequently can merely be guessed at. A previous history of peritonitis may help; while the immediate attack is often due to some violent exertion. 4. Intussusception is also sudden in its onset, as a rule, beginning with griping pain, more or less violent, usually referred to the umbilical region. Subsequently there are colicky pains from time to time, with the ordinary signs of obstruction,

followed by those of enteritis or peritonitis. The other important diagnostic evidences of invagination are the passage of blood per anum, in some cases mixed with mucus or decomposed tissues; the detection of a "sausage-shaped" tumor in the abdomen, corresponding to some part in the intestine, presenting peristaltic movements, and altering as the case progresses in its direction, extent, and shape; and the end of the intussuscepted portion being felt or seen by examination through the anus, or more or less of it being discharged in a gangrenous condition. In the latter case sudden perforation and its consequences may happen. There are generally some important distinctions between invagination of the small and large intestines, viz., that in the former the symptoms are greatly more severe and acute in their progress; hæmorrhage is much more abundant, blood being sometimes vomited also; while in the case of the large bowel there is generally much tenesmus, with dysenteric stools. Physical examination may afford some aid. A large proportion of these cases end fatally, those in which the large intestine is involved sometimes lasting many weeks or months. The several events which may happen in their course are indicated in the account of the morbid anatomy. 5. It is scarcely practicable to indicate the characters of obstruction from spasm or paralysis of the muscular coat. The occurrence of chronic constipation in a hysterical female, ending in complete obstruction, might suggest paralysis, though probably the previous accumulation of *feces* actually originates the obstruction. It generally yields to treatment.

PROGNOSIS.—Without entering into details, it will be evident that all forms of obstruction of the bowels are exceedingly dangerous. The most speedily fatal are strangulations and intussusceptions. The chronic varieties are liable at any moment to end in complete closure. Accumulations may often be got rid of, and thus recovery be brought about.

TREATMENT.—This must be considered separately, according as the obstruction is chronic and gradual in its progress, or sudden and acute.

In chronic cases the main principles are to regulate the diet strictly, allowing only liquid or pultaceous, highly digestible, and nutritious articles in moderate quantities; to endeavor to keep the bowels acting comfortably, for which purpose mild enemata answer best, at the same time avoiding the use of strong purgatives; to remove, if possible, anything causing compression, as well as accumulations; to support the strength of the patient and improve the general condition; to treat troublesome symptoms referable to the digestive organs; and, in appropriate cases, to have recourse to certain operations.

Should there be a stricture in the rectum, it may often be dilated successfully by the cautious use of the bougie. In certain instances also it is desirable to make an artificial anus above an obstruction, as described in surgical works, which may prolong life considerably.

In cases of acute obstruction, from whatever cause, a matter of prime

importance is not on any account to excite the intestines by giving powerful purgatives. It is allowable to use enemata carefully, so as to clear out the bowel below the seat of obstruction. Of course little or no food should be taken by the mouth, and soon the smallest quantity is immediately rejected; therefore all the necessary support, including stimulants when required, must be administered per rectum, and frequently considerable quantities of these are needed. The patient may be permitted to suck ice. The most important internal remedy is opium in full doses; or subcutaneous injection of morphia may be employed. Belladonna is also highly recommended, or this drug combined with opium. In the treatment of intussusception tobacco has been employed, usually in the form of an enema of its infusion, but it is a dangerous remedy. External applications of dry heat, poultices, fomentations, turpentine stupes, or sinapisms, are very serviceable. Vomiting and other symptoms call for the usual remedies for their relief. In the case of intussusception, the gradual injection of a large amount of liquid or air per anum has been frequently practiced, and apparently with benefit.

The question of an operation presents itself in many of these cases. Of course if there is any evident or suspected hernia, surgical interference is necessary. Another operation which might be indicated, and which has been successfully accomplished, consists in opening the abdomen with the view either of removing some internal strangulation, or of reducing an invagination. If there is good reason to believe that the former exists, it is decidedly permissible to risk opening the abdomen, especially if the case seems otherwise hopeless. As regards intussusception, it is considered by most authorities only allowable to attempt its reduction when the large intestine is involved. Under any circumstances the results are not very satisfactory.

CHAPTER XLI.

INTESTINAL WORMS—HELMINTHIASIS.

In the present article it is intended to give a brief account of the main facts relating to those animal parasites which infest the alimentary canal of human beings; but it will be convenient, in noticing their life-history, to allude to another phase of their existence, as they are found in other organs of the body. For a complete account of this subject the reader is referred to Dr. Cobbold's valuable work.

The ordinary intestinal worms include: 1. *Cestodes* or *tape-worms*.
a. *Tænia mediocanellata*. b. *Tænia solium*. c. *Bothriocephalus latus*.
2. *Nematodes*. a. *Ascaris lumbricoides* (round-worm). b. *Ascaris oxyuris vermicularis* (thread-worm or seat-worm). c. *Tricocephalus*

dispar (hair-headed or whip-worm). Among rare varieties are mentioned *tænia nana* or *egyptica*, *elliptica*, and *flavo-punctata*; *bothrioccephalus cordatus*; *ascaris mystax*; *dochmius duodenalis*; *distoma crassum* and *heterophyes*.

ETIOLOGY AND DEVELOPMENT.—It seems tolerably certain that no intestinal worm ever develops in the bowel directly from an ovum deposited there by a previous tenant, but that this must be first discharged and undergo metamorphosis, being afterwards conveyed by some means through the mouth into the alimentary canal in a certain stage of development, and when it reaches its peculiar habitat it grows into the adult animal. As regards the development of the nematodes, an embryo forms in each ovum after its discharge in the stools, or in the case of the thread-worms, even while in the intestines; no further change occurs while the ovum is outside, though it may retain its vitality for a long period. In this condition it is supposed to enter the alimentary canal in various ways, such as in water, vegetables, fruit, or impure starchy substances. The ova of thread-worms may also probably be carried to the mouth by the fingers of a person already infected, after scratching the anus. From some experiments, however, it would appear that the embryos of round-worms will not undergo further change when introduced into the stomach in the free state, and it has been suggested that they are taken up by some other animal, such as a small worm or insect or its larva, which is swallowed along with vegetables and other articles of diet.

The development of tape-worms is better known. Segments of these, containing abundant ripe ova, separate and are discharged per anum, or even break up within the bowel; the ova escape and are scattered about in various ways; they are then swallowed by different animals, especially by pigs, oxen, and sheep, mixed with their food. In the alimentary canal the shell of the ovary ruptures, and then the embryo (*pro-scolex*) escapes, attaches itself to the mucous surface, and works its way into the tissues, until it reaches a suitable spot, where it settles down and undergoes further changes, presenting a head and neck with appendages like those of a tape-worm (*scolex*), from which a vesicular appendage or bladder hangs down. In this stage the worm is named a *cysticercus* or bladder-worm, such as is seen in the muscles, liver, brain, and other organs and tissues of different animals, sometimes in human beings. Each tape-worm has a special form of *cysticercus*; that of the *tænia solium* is named the *cysticercus cellulosus*; that of the *tænia mediocanellata*, the *cysticercus mediocanellata*. This *cysticercus* may remain for some years, or finally perish; if, however, it in any way reaches the alimentary canal of the particular class of animal which it infests in the adult condition, it becomes attached by the head, the vesicle falls off, and then a succession of segments form, constituting the ordinary tape-worm. The usual way in which these larvæ

reach the stomach is through eating the raw or imperfectly-cooked flesh of the animals which they infest; thus the *tænia solium* comes from pig's flesh (measly pork, etc.), *tænia mediocanellata* from beef; *bothriocephalus* is believed to be conveyed by fish or molluscs.

Different varieties of tape-worm are found in different parts of the world. In this country the *tænia solium* and *medio-canellata* are the forms met with, the latter quite as frequently as, if not more frequently than, the former. *Bothriocephalus* is prevalent in Eastern Europe as far as the Vistula, and in Switzerland, especially along seacoasts and rivers. Tape-worm is by far most frequent in those countries where much pig's flesh is consumed, and individuals who do not eat this, such as Jews, are particularly exempt from the complaint. It is frequently observed among those who in their occupation are in the habit of putting knives used for cutting raw meat into their mouths, such as butchers, cooks, etc.; also among those who indulge in raw or very underdone meat, sausages and such articles, as then the parasites are not destroyed. It must be remembered that in this country beef is often the meat by which tape-worm is communicated. The *bothriocephalus* is supposed to be taken in drinking-water. Women suffer more frequently than men, and usually the persons affected are between 16 and 40 years of age.

Round and thread-worms are principally found in children, especially if they are in bad health or improperly fed and dirty. Round-worms are very prevalent in some parts of the world, viz., the Southern States of America, Greenland, Iceland, Brazil, and some parts of Holland, Germany, and France, especially in low and damp districts. They are common enough in this country. It is presumed that an unhealthy condition of the enteric mucous membrane, leading to the formation of much viscid mucus, favors the development of worms.

DESCRIPTION.—Only the main characters of the ordinary worms can be noticed here, so as to enable them to be recognized.

I. TAPE-WORMS. In the adult form (strobila) tape-worms are elongated, narrow, flattened, or tape-like in form, consisting of a head, neck, and a series of thin, flat, quadrilateral segments or links (proglottides), varying in number according to the length of the worm, united by a softer and more transparent tissue. The links grow from behind the neck by budding, and then pass on, making room for those more recently formed, so that the oldest are the most distant from the head. At first they are very small, but enlarge considerably as they become more mature, at the same time altering in form somewhat and presenting a more complicated structure. Tape-worms are parenchymatous in structure, consisting of a soft, whitish, or yellowish-white contractile tissue; having no mouth or alimentary canal; but presenting a water-vascular system communicating between the segments, and well-developed sexual organs. These are not evident in the most recent links; the female apparatus appears first as a median tube with lateral branches, subsequently becoming more divided and developing ova, which almost completely fill the terminal links, rendering them opaque, and in these embryos may be visible. The male organs consist of tortuous seminiferous tubes and a penis. Each segment

is hermaphrodite, and the sexual orifice is either single or double, opening either laterally or on one surface. All the varieties of tape-worm inhabit the small intestines ordinarily; rarely one may enter the large bowel or the stomach. As a rule only a single worm is present; occasionally two or more.

1. <i>Tænia Solium</i> .	2. <i>Tænia Mediocanellata</i> .	3. <i>Bothriocephalus Latus</i> .
Length varies from a yard to 100 or 150 feet or more, but average is stated by different authorities at from five or seven to twenty or thirty feet. Head very small, somewhat globular or bulbous, with a slightly prominent conical snout or rostellum in front, surrounded by a double row of curved silicious hooks, from twelve to fifteen in each row; and further back four suckers, symmetrically arranged. Neck extremely slender, from one-half to nearly an inch long, transversely marked. Segments in their earliest stage very small and much broader than long; gradually become more flattened and altered in the relation of their diameters, so as to be first square and afterwards oblong, being much more longer than broad, with the ends narrowed, especially the anterior. Mature links measure about half an inch long and one-quarter inch broad. Male and female organs open by one orifice, which is situated laterally in a little projection, now on one side, now on the other, but not regularly alternating.	Has a general resemblance to <i>tænia solium</i> , with the following differences. Length usually greater. Head larger, has neither snout nor hooks, being flattened in front, but its four suckers are very prominent and powerful. Leuckart describes a fifth smaller one between them. Links more numerous, broader, thicker, and firmer. Sexual organs more developed and divided, and orifice nearer the posterior border.	Length very considerable. Head obtuse or club-shaped, having no hooks or prominences, but merely two longitudinal slits or grooved suckers, one on each side. Neck very short. Segments exceedingly numerous; not distinctly visible for a little distance from the head; at first nearly equal in diameters, but soon much broader than long; have a slightly brownish color. Sexual openings in the middle of one surface of each segment, near its posterior border, and not lateral; they are distinct, that of the male apparatus being anterior. Ova of a brown color.

II. NEMATODES. The main characters of these are indicated in the following table:

1. <i>Ascaris Lumbricoides</i> .	2. <i>Ascaris Vermicularis</i> .	3. <i>Tricocephalus dispar</i> .
Form elongated and cylindrical, but tapering towards the ends, especially the anterior. Length from six to twelve or sixteen inches; and diameter two to three lines. Appears reddish, grayish-red, or yellowish-white, semi-transparent, firm, and elastic. Head has three small prominences, with the mouth between, lined with numerous teeth. A circular depression separates it from the body. The body presents fine transverse markings. Sexes are distinct. Male shorter, and curved posteriorly, where the sexual organs are placed. Female straighter, and thicker at the hinder extremity; has the sexual opening about the end of the anterior third. Habitat, small intestines, but often migrates into the large bowel and out through the anus; or rarely to the stomach, œsophagus, mouth, nares, frontal sinuses, windpipe, bile, and pancreatic ducts or gall-bladder, peritoneum, vagina, urinary organs, and various other parts. Number, usually several; may be hundreds; sometimes only one.	Very small and delicate, fusiform, males measuring from one to two lines long, females about five lines. Whitish and semi-transparent; surface presents fine transverse striae. Head has a terminal mouth, with three scarcely evident lips, and a wing-like expansion on the dorsal and ventral aspects. Male is rolled up posteriorly, where the sexual organs are placed. Female is straight or but slightly bent, and has the vulva about the junction of the anterior and middle thirds. Habitat, the rectum and lower part of colon. Often migrate around the anus, into the vagina, urethra, or under the prepuce. Have been seen in the small intestines and stomach. Number usually very great; hundreds or thousands.	Thread-like in form, being from one to one and a half or two inches long. Posterior end thicker than anterior, which is hair-like and ends in a simple terminal mouth. Male is the smaller, and is spirally coiled posteriorly. Female is larger and thicker, only slightly curved; the uterus contains an immense number of ova. Habitat, usually the cœcum, rarely the colon, very rarely the ileum. The head is generally imbedded in the mucous membrane, while the body moves freely. Number, usually not great, but may be hundreds.

SYMPTOMS AND DIAGNOSIS.—Worms frequently exist in the alimentary canal without exciting any evident symptoms. When present these are usually indicative of local irritation; reflex disturbance; and more or less constitutional disorder. Occasionally worms lead to congestion, inflammation, superficial erosions of the mucous surface, or even slight ulceration; and in exceptional cases they may even cause obstruction of the bowels, or by migrating into the stomach, bile-ducts, liver, larynx, peritoneum, and other parts, originate dangerous symptoms referable to these parts. It may be stated as a general rule that the symptoms are more marked in delicate and weakly persons, or in those whose nervous system is highly susceptible; and that they are proportionate to the number and size of the worms.

The local symptoms attending the tape- and round-worms are uneasiness, curious sensations, or actual griping pain in the abdomen, especially about the umbilicus, sometimes amounting to attacks of severe colic, attended with vomiting or retching and faintness; capricious and variable appetite, often with craving for special and indigestible articles of food; furred tongue and foul breath; nausea or vomiting; irregularity of the bowels, constipation and slight diarrhoea alternating from time to time, the stools sometimes containing mucus; flatulence with distended abdomen. The main reflex phenomena described include itching at the various mucous orifices, causing especially scratching of the anus and picking at the nose; salivation; grinding of the teeth during sleep, which is uneasy and disturbed; dull frontal headache, with giddiness; noises in the ears; squinting, dilated pupils, œdema of eyelids, flashes and specks before the eyes; twitchings of the limbs, or facial muscles, or violent convulsions ending fatally; choreic, hysterical, epileptic, or even maniacal attacks; deranged menstruation; palpitation; a feeling of constriction in the throat. Among the general symptoms observed are more or less wasting, pallor, sense of debility and languor, pains in the limbs, fretfulness and depression of spirits.

In a diagnostic point of view these symptoms are by no means characteristic of worms, and it is often a question how far they are due to these; still when they are present worms should always be thought of. The diagnosis may be verified by the passage per anum of fragments of a tape-worm or of entire round-worms; and, if necessary, remedies may be given with the view of aiding their expulsion. Microscopical examination of the stools for ova is recommended in suspected cases. Portions of tape-worm sometimes escape spontaneously as the patient is walking along.

Thread-worms are very common in weakly and dirty children, and as they are often extremely numerous, they give rise to much local irritation, causing severe itching and tickling about the anus, which leads to constant scratching; this is especially intense towards night, and

may gravely interfere with sleep. Occasionally these worms excite considerable dysenteric symptoms, and not uncommonly originate prolapsus ani. Also they frequently pass into the vagina, causing much irritation here, leading to catarrh, undue sexual excitement and masturbation, or now and then to severe hæmorrhage. By getting under the prepuce they also promote the habit of masturbation in males. On examination the worms may often be seen moving about the anus, as well as in abundance in the stools. Various reflex symptoms similar to those associated with other worms are said to be due to thread-worms, but this is doubtful.

The *tricocephalus dispar* does not give rise to any symptoms.

PROGNOSIS.—Most worms may be readily got rid of if properly treated. Tape-worms are sometimes difficult to remove completely, but with systematic management a cure may almost always be effected. It is safest to see that the head of a tape-worm is discharged, else if this remains a further growth will probably take place; however, it is affirmed that if only the head and a small portion of the neck is left the worm will die; and further, the nearer the head any portion is which is detached, the more easily will the rest be got rid of. Worms may now and then prove highly dangerous by their migrations, or by causing obstruction of the bowels; death may also occur from reflex convulsions excited by them.

TREATMENT.—If worms are present in the intestines, of course the first object in treatment is to get them expelled. The remedies for this end must vary with the nature of the parasite. For tape-worm the following plan of treatment is usually efficacious: To let the patient take only liquids, such as milk and beef tea, for a day; then to administer a full dose of castor-oil in the evening; and finally, early on the following morning, if the oil has acted well, to give a draught containing the liquid extract of male fern, in a dose of 10 drops to $\mathfrak{z}\text{i}$ or $\mathfrak{z}\text{iss.}$, according to age. The draught may be made up with sugar, mucilage, and milk; or with the yolk of an egg and cinnamon water. The object of this plan is to clear out the bowels so as to expose the worm, and then the male fern acts upon it and kills it. Sometimes it is desirable to follow this up by another dose of castor-oil, but generally this is not needed, as the drug itself acts as a purgative. Some authorities prefer giving the extract in smaller doses, frequently repeated; others employ the powdered fern. In order to see whether the head of the worm is discharged, each stool must be received into a separate vessel, then mixed with water and filtered through coarse muslin.

Other anthelmintics employed for the destruction of tape-worms are kouso, followed by a cathartic; kamela powder ($\mathfrak{z}\text{i}$ to $\mathfrak{z}\text{ij}$ in treacle or syrup); decoction of the bark of the root of pomegranate ($\mathfrak{z}\text{ij}$ in Oj , boiled down to Oss.); powdered areca nut; oil of turpentine ($\mathfrak{z}\text{i}$ to $\mathfrak{z}\text{ss.}$); and petroleum (\mathfrak{xx} to \mathfrak{xxx}). If the worm projects through the anus,

it has been recommended to roll it gradually round a piece of stick, and thus draw it out; or to apply some poisonous agent to the protruded portion.

For round-worms the most efficient remedy is *santonin*, which is the active principle of the popular worm-seeds. It is well before administering it to give an aperient, such as a little *jalap* with *scammony*; and to limit the diet to liquids for a day. *Santonin* may be employed alone, gr. i-v every morning for two or three days, in sugar or syrup or made up into lozenges or with gingerbread. It seems to be more efficacious when mixed with castor oil, and *Kückenmeister* advises that from gr. ij-iv be dissolved in ℥i of the oil, and ℥i taken every hour until it acts. Other preparations used containing *santonin* are an ethereal extract of worm-seeds and *santonate* of soda. *Mucuna* and powdered tin are also employed for the expulsion of round-worms, which act by mechanical irritation; some rely merely upon strong purgatives.

Santonin is also useful internally for thread-worms, but these are decidedly best got rid of by means of injections, of which many kinds have been employed. Any of the following will answer well, viz.: Common salt and other alkaline salts dissolved in water or gruel (℥i to Oj); *santonin* with castor oil; infusion of *quassia*; infusion or decoction of wormwood; tincture of steel (℥i to Oj of water or infusion of *quassia*); olive oil; lime-water; decoction of *aloes*; decoction of *rue*; or even mere water if employed freely for a few days. Cleanliness is of great importance.

The *tricocephalus* requires no special treatment.

In all cases of worms it is essential to look to the state of the general health, and improve this by means of steel and other tonics, with cod-liver oil, if required; as well as by regulation of diet and hygienic measures. The alimentary canal must also be attended to and the bowels kept freely acting, so as to prevent accumulation of unhealthy mucus. *Scammony*, *jalap*, *rhubarb*, and castor oil are the best aperients in these cases, and the powders may be advantageously mixed with carbonate of soda or *magnesia*.

The prevention of worms is a matter of considerable importance in some parts of the world, especially as regards tape-worms, and this can only be effected by taking every precaution against those habits mentioned under the etiology by which the ova are conveyed into the stomach, such as eating raw or partially cooked meat; putting knives into the mouth; drinking impure water, etc. Stools known to contain any kind of worms or their ova should be immediately destroyed. Of course meat that is measly ought on no account to be taken as food. In children important prophylactic measures against worms are the maintenance of good health; the preservation of the digestive organs in a satisfactory condition; and attention to cleanliness.

TRICHINOSIS.

It will be convenient to consider in the present chapter a disease due to the entrance into the human body of a parasite named *trichina spiralis*. It is very rarely met with in this country, but is not uncommon in some parts of the continent, where it occurs sometimes as an epidemic.

ETIOLOGY AND PATHOLOGY.—Trichinæ are introduced into the human body solely by eating pig's flesh in which they exist, either in a raw or imperfectly cooked condition, or in the form of pickled and smoked articles, sausages, etc. When this reaches the stomach and bowels, the parasites are liberated and develop with great rapidity, the females being far the more numerous and larger, and forming an immense number of young trichinæ, which perforate the intestinal wall, migrate along the mesentery to the spine and then all over the body, entering the muscles, penetrating even the sarcolemma. These are their habitat, and here they set up inflammatory action, becoming surrounded by a capsule or shell. It is supposed that there are several productions of young trichinæ in the alimentary canal, with subsequent migrations.

ANATOMICAL CHARACTERS.—In man trichinæ at first excite gastro-enteric catarrh, often attended with enlargement of the mesenteric glands. After about the fifth or sixth week the muscles are seen with a lens to present fine striæ or minute dots, of a grayish-white and opaque aspect, which are collections of the parasite contained in capsules or cysts produced by their irritation. These become more abundant as the case advances, and are chiefly observed in the muscles of the loins, diaphragm, intercostals, muscles of the neck, eye, larynx, and tongue. In the limbs they are mainly found in those nearest the trunk; and they are most numerous near their tendinous attachments. The affected parts feel unusually firm and resistant. On microscopic examination the muscular fibres are seen to be more or less destroyed, and the interstitial connective tissue increased. Each little cyst is somewhat ovoid in shape, at first transparent, but soon becoming thicker and more opaque, and ultimately calcifying. The trichina is coiled up in it, and is very minute, the female being larger than the male. The head is finely pointed, unarmed, with a minute mouth in the centre. In fatal cases extensive bronchitis, pulmonary congestion or inflammation, venous thrombosis, and parenchymatous degeneration of various organs are frequently observed.

SYMPTOMS.—Trichinosis generally begins with symptoms of more or less gastro-enteric disorder, such as pressure and fulness in the epigastrium, impaired appetite, discomfort after eating, nausea or vomiting, eructations, colicky pains, and diarrhœa, with a feeling of much languor and depression; in some cases the onset is characterized by vio-

lent sickness and purging, simulating cholera or irritant poisoning. Occasionally the disease sets in quite insidiously, with merely a feeling of lassitude and depression, wandering pains, and stiffness in the limbs. The subsequent characteristic symptoms are those dependent upon the condition of the muscles. Those of the limbs which are affected become painful, tender, swollen, hard, and rigid; there is much stiffness, movement being greatly impaired, and the joints are fixed in a state of more or less flexion, any attempt to extend them causing much pain. From implication of various muscles result attacks of severe dyspnoea, aphonia, trismus, dysphagia, impaired movement of the tongue, and other symptoms. A peculiar œdema is also observed, affecting the face and eyelids, and extending in the limbs from the upper part towards the hands and feet.

Symptomatic pyrexia accompanies this condition, often severe, the temperature sometimes rising to 106° , and the pulse to 120° or 140° ; abundant clammy perspirations may be observed, and occasionally miliaria. In cases tending towards a fatal issue, low typhoid symptoms set in, frequently with signs of bronchitis, pneumonia, and other inflammations. If recovery ensues, the muscular symptoms subside, as well as the pyrexia, but convalescence is usually protracted, much debility, anæmia, and œdema remaining for a considerable time.

DIAGNOSIS.—Trichinosis may in severe cases be mistaken at first for cholera or irritant poisoning. It may also simulate typhoid fever. After a time the symptoms referable to the muscles are quite characteristic.

TREATMENT.—To prevent trichinosis, meat containing the parasites must be avoided, and microscopic examination of pig's flesh is practiced in some parts of the continent before it is allowed to be sold. In order to be quite safe, the best plan is never to eat any pig's flesh which has not been thoroughly cooked. In the treatment of the disease, a matter of the first importance is to get rid of the trichinæ in the alimentary canal by means of castor oil or some other aperient, which may be given even though there is diarrhoea. Benzine, carbolic acid, and other remedies have been administered, with the view of destroying the parasites, but it is doubtful whether they succeed. The general treatment must be supporting, with quinine and stimulants. Hot and anodyne fomentations or warm baths relieve the symptoms connected with the muscles most effectually.

CHAPTER XLII.

DISEASES OF THE LIVER AND ITS APPENDAGES.

CLINICAL CHARACTERS.—1. Morbid sensations connected with the liver are referred mainly to the right hypochondrium, but may extend across the epigastrium to the opposite side, or shoot in various directions. They include different kinds of pain, with or without tenderness; or merely a sense of uneasiness, fulness, weight, and heaviness. Sympathetic pains in the right shoulder are very common.

2. Some important symptoms result from disturbance of the biliary functions, the chief being those associated with jaundice, under which they will be discussed. Bile may be secreted in excess, or be of improper quality, and thus act as an irritant, causing bilious diarrhoea and vomiting. Murchison has attributed a variety of morbid conditions and ailments to disorder of the biliary secretions.

3. Obstruction of the portal circulation leads to mechanical congestion of its tributary veins. The obvious clinical phenomena resulting therefrom are those indicating gastro-intestinal disturbance, with catarrh and its consequences; hæmorrhage into the alimentary canal; distension of the superficial abdominal veins; ascites; enlargement of the spleen; and hæmorrhoids. After death the veins within the abdomen are often found much enlarged and varicose; while the organs present the usual morbid changes which follow long-continued venous congestion..

4. If the liver is enlarged, it sometimes originates symptoms by pressing upon neighboring structures, such as the diaphragm, vena cava, or duodenum.

5. *Physical examination* of the liver may demonstrate either displacement; alteration in shape; enlargement; contraction; or alteration in its characters on palpation. The general characters of hepatic enlargement are as follows: (i.) Its site corresponds to that of the liver, or there is a history of its having grown from this direction; it does not descend into the pelvis, but can be traced within the margin of the thorax, and appears superficial; sometimes it is distinctly visible, or bulges out the lower part of the chest. (ii.) Though the dimensions may be very great, yet as a rule the normal general outline of the liver can be traced more or less distinctly; while the sensations on palpation are often sufficiently characteristic. (iii.) The organ is somewhat movable on manipulation, but not to any marked extent. (iv.) On percussion there is absolute dulness, with considerable sense of resistance generally; the dulness can be traced upwards towards the chest, and may have the curved outline said to be characteristic of the liver; it is, however, influenced by different degrees of distension of the stomach and bowels. (v.) The movements of the diaphragm are often interfered with, especially on the right side; but the liver is generally altered in position by deep breathing. (vi.) Posture may also influence the organ, it being more prominent and lower in the abdomen in the standing posture.

6. Occasionally the gall-bladder presents an enlargement having the following characters: (i.) It occupies generally the right hypochondrium, and can be felt coming from under the margin of the liver, appearing to be superficial; occasionally, however, it is so much enlarged as to extend down to the crest of the ilium. (ii.) As a rule the shape is pyriform, with the base towards the surface. (iii.) The surface is generally smooth, and the enlarged organ has an elastic or fluctuating feel. (iv.) Almost always the tumor is very movable from side to side, turning on a fixed point, which lies under the liver; even a change of posture may alter its position considerably. Now and then it is fixed by adhesions.

CHAPTER XLIII.

ON FUNCTIONAL DISORDERS OF THE LIVER.

I. HEPATALGIA.

THE occurrence of intermittent attacks of severe pain in connection with the liver has been attributed, especially by the late Dr. Anstie, to a simple neuralgia in some instances. This affection is but a part of a general nervous condition, attended with similar pains in other parts, and deep mental depression. The attacks are not accompanied with vomiting, but it is said that there may be jaundice. The main difficulty in diagnosis lies in separating this pain from that due to the passage of a gallstone.

II. JAUNDICE—ICTERUS.

Jaundice is another of those symptoms which has been dignified by being described as a special disease. Essentially it merely means the peculiar discoloration of skin and other structures, which is observed when the bile-pigments accumulate in the blood.

ETIOLOGY AND PATHOLOGY.—Cases of jaundice have long been divided into: 1. Those in which there is a mechanical obstruction to the escape of the bile through the ducts. 2. Those in which there is no such obstruction.

1. *Jaundice from Obstruction*.—This may be due to: (i.) Impaction of some foreign body in the hepatic or common bile-duct, viz., gall-stones; thickened or gritty bile; mucus; rarely parasites, either formed in the liver or its duct (*distoma hepaticum** and hydatids), or having entered from the intestines (round-worm); very rarely fruit-stones or other bodies which have passed into the duct from the bowels. (ii.) Catarrh of the mucous membrane of the ducts, or of the duodenum about the orifice, causing narrowing of the calibre. (iii.) Organic changes in the walls of the duct or at the orifice, leading to more or less stricture, or even to complete obliteration, viz., congenital constriction or closure; thickening of the walls from inflammatory changes; perihepatitis; cicatrization of an ulcer either in the duct or duodenum. (iv.) Pressure upon the duct, invasion of its canal, or closure of its

* The *distoma hepaticum* or liver-fluke is a small trematode worm, often found in sheep, very rarely in the human being, occupying either the gall-bladder or bile-ducts. It is of a flattened, elongated, oval form; soft; and brownish or yellowish in color.

opening by tumors or growths, especially by projecting growths from the liver; enlarged glands in the portal fissure; and pancreatic disease implicating the duodenum; rarely by a pyloric tumor; growths in or behind the peritoneum; hepatic aneurism; fecal accumulation in the colon; uterine and ovarian enlargements, including pregnancy; or a renal tumor or displaced kidney. (v.) Functional disturbance of the muscular coat of the duct, in the way of spasm or paralysis (?).

Physiologists differ in their views as to how the bile is secreted, and this influences the opinions as to the pathology of obstructive jaundice. It is generally maintained that both the bile-acids and pigments are formed in the liver; some believe, however, that the latter are generated either partly or entirely in the blood, and merely separated by the liver. Hence arise the two theories: 1. That the discoloration of jaundice is due to excessive absorption of the bile by the veins and lymphatics after its formation. 2. That it results from suppression of its secretion, and hence retention of the pigment in the blood. The former is probably the correct view, and the intensity of the jaundice will be in proportion to the rapidity with which the secretion of bile is going on, and to the slowness of its decomposition in the blood. Absorption is always proceeding during health, but the bile thus taken up is speedily changed in the process of nutrition.

2. *Jaundice without Obstruction.*—The conditions under which this variety is supposed to occur are: (i.) In certain specific fevers, viz., yellow, remittent, intermittent, and relapsing fevers; very rarely in typhus, typhoid, or scarlatina. (ii.) When certain poisons are present in the blood, especially in connection with pyæmia; snake-bites; poisoning by phosphorus, mercury, copper, or antimony; inhalation of chloroform or ether. (iii.) In acute or chronic atrophy of the liver; or after destruction of its tissue from any cause. (iv.) In congestion of the liver. (v.) From disturbed innervation, especially after sudden intense mental emotion. (vi.) When the blood is insufficiently aerated, as in pneumonia, new-born infants, or as the result of overcrowding and bad ventilation. (vii.) Where bile is formed in much excess. (viii.) In cases of habitual or long-continued constipation. (ix.) In certain states of the portal system of veins, as when they contain abundant pigment-granules, or are unusually empty after profuse hæmorrhage from the alimentary canal. (x.) As an epidemic.

Before mentioning the various explanations given of the occurrence of jaundice under the above circumstances, I cannot but express my agreement with those who consider that in many of these cases it results from obstruction, at all events to some degree, which may arise from pressure upon the smaller duct within the liver; catarrh of the main ducts; or the formation of plugs of mucus. The views suggested by different writers as to the pathology of the various forms of non-obstructive jaundice are that it is dependent upon: 1. Suppression of secre-

tion. 2. Increased absorption, so that more bile enters the blood than can undergo decomposition, either from excessive secretion; undue retention of bile in the intestines, owing to constipation; or diminution of pressure in the portal vessels. 3. Impaired and delayed metamorphosis of the bile-elements in the blood, and some think that the bile-acids are converted in this fluid into bile-pigments, owing to imperfect oxidation. 4. Conversion of the hæmatin of the blood into bile-pigments. With regard to the influence of nervous disturbance in producing jaundice, it is presumed that this may affect the activity of the secretion; the state of the portal veins; or the rapidity of the changes in the blood.

Jaundice is by no means a necessary accompaniment of even grave organic disease of the liver itself, and, in such cases, when it is very marked, it generally results from some projection from this organ interfering with the main ducts; or from the glands in the portal fissure being involved. It may be due to destruction of the hepatic tissue; or to the ducts or the circulation in the interior of the liver being interfered with.

ANATOMICAL CHARACTERS.—In jaundice not only are the skin and conjunctivæ more or less stained with bile-pigment, but also most of the tissues, organs, and fluids of the body, as well as morbid exudations and effusions. In the skin the pigment accumulates chiefly in the rete mucosum, also involving the sweat-glands considerably. The nerve-tissues are but slightly affected, and the mucous membranes generally, with their secretion, still less. The bile-pigments are found in the clot and serum of the blood, but not the acids; in prolonged cases coagulation is imperfect, and the corpuscles are altered in their characters; while not uncommonly extravasations of blood are evident. In cases of obstructive jaundice the liver itself becomes at first enlarged uniformly, without any alteration in shape, and mottled of a more or less deep yellow tint, in some cases being olive-green; its ducts are distended, and in time numerous particles of pigment are seen in the cells. Should the obstruction implicate the common duct, the gall-bladder will be enlarged. If the obstruction is persistent, the liver undergoes degeneration, becoming atrophied, very dark, sometimes almost black, and softened, many of its cells being destroyed, leaving only a granular detritus under the microscope. The kidneys also are much changed in prolonged cases, being deeply colored, their tubules containing a black or brown deposit, and their secreting cells presenting granules of pigment, or ultimately breaking down.

SYMPTOMS.—The most obvious clinical phenomena associated with jaundice are those derived from the external discoloration; the characters of the urine; and the consequences of absence of bile from the alimentary canal. Usually the signs are first afforded by the urine; next by the conjunctivæ; and lastly by the skin. The conjunctivæ are

more or less deeply tinged yellow. The skin may present a variety of tints, from a faint yellow to a brownish- or blackish-green. The color is deepest where the epidermis is thin, and varies with age, complexion, amount of fat, etc. If the lips or gums are pressed, so as to expel the blood, a yellowish hue is often observed. The urine exhibits a color ranging from a light saffron-yellow to one resembling mahogany or porter; on standing it usually becomes greenish. Its froth is yellow, and it will tinge white linen or blotting-paper dipped into it, often staining the under-clothing. Chemical examination is most important, as indicating the presence of bile-pigments; and, as many believe, of bile-acids. The former are tested for by nitric acid. Either a few drops of urine and acid may be placed on a white porcelain surface, and allowed to come into contact; or a little urine may be poured into a test-glass, and the acid allowed gently to run down its interior, so as to sink to the bottom. A play of colors is observed, to violet, green, blue, and red, these soon disappearing. The bile-acids are detected by Pettenkofer's test, viz., by adding a fragment of lump sugar to a little urine in a test-glass, and then pouring in a small quantity of strong sulphuric acid, drop by drop, allowing it to trickle down the side of the tube. A deep purple color is produced where the acid and urine meet. Dr. George Harley and others affirm that the bile-acids are only present in the urine in cases of *obstructive* jaundice, and not in that due to *suppression*; also that they may disappear in prolonged cases of the former, owing to destruction of the liver-tissue. Another important character is, that the urine often contains leucin and tyrosin, crystals of which may be seen under the microscope after careful evaporation of some of the excretion to a syrupy consistence. In some cases the quantity of urine is deficient at first; the reaction is acid; the proportion of urea and uric acid varies, and they may be in excess. In advanced cases sugar sometimes appears. Renal epithelium or casts tinged with biliary coloring matters are occasionally observed.

When the bile does not reach the intestines, the consequences are constipation with unhealthy stools, these being deficient in coloring matters, often pale-drab or clay-colored, dry, offensive, and containing excess of fat; and the formation of much foul gas from decomposition, with consequent flatulence and passage of fetid flatus. Occasionally diarrhoea is observed from time to time; or dysenteric symptoms set in. There is usually a disinclination for food, especially for fatty matters, and eructations are common, which may have a bitter taste. Evidence of the presence of bile is often afforded by the sweat, milk, saliva, and tears. From the accumulation of bile-acids in the blood result not uncommonly cutaneous itching, which may be very distressing; slowness of the heart's action and pulse, which may fall to 50, 40, or even 20 per minute; and a feeling of languor, depression, debility, lowness of spirits, incapacity for exertion, irritability, and drowsiness. The

symptoms last mentioned are also partly due to the emaciation and impaired nutrition which usually become soon apparent, in prolonged cases being very marked. In some instances urticaria, lichen, boils, carbuncles, or petechiæ are observed. Yellow vision (*xanthopsy*) is an extremely rare phenomenon, and its cause is very uncertain.

Jaundice, especially the non-obstructive variety, may be accompanied with typhoid symptoms; low nervous phenomena; or dangerous hæmorrhages, particularly from the stomach and bowels, ending speedily in death. It is important to observe that these phenomena are often quite out of proportion to the intensity of the jaundice. They have been attributed to the accumulation in the blood of bile-acids, of cholesterin, of products resulting from the decomposition of bile-acids or their formative elements, or of some noxious substance formed in the cells of the liver; or to the metamorphosis of materials in the process of preparation for excretion by the urine being checked or modified, owing to a deficiency of bile, which is required for these changes, so that, instead of urea and such compounds, intermediate products are formed, which collect in the blood and act as poisons. Might it not be that, in some of these cases at all events, the above symptoms are independent of the jaundice, and result from some general morbid state, or some condition of the kidneys which leads to blood-poisoning?

Physical examination will probably in cases of obstructive jaundice reveal in a short time enlargement of the liver, not great, and quite regular. If the common duct is obstructed, the gall-bladder may also present a fluctuating enlargement. In prolonged cases the liver may ultimately afford the physical signs of atrophy.

The course, duration, and intensity of jaundice vary greatly according to its cause. It may be merely a slight temporary disturbance; or permanent and extreme in degree.

DIAGNOSIS.—The first matter in diagnosis is to be certain that there is jaundice. The discoloration of the skin might possibly be simulated by a chlorotic tint; the cachexia of chronic lead-poisoning, malaria, or cancer; the color associated with suprarenal disease; or bronzing from exposure to the sun. The conjunctivæ and urine should always be particularly examined. It must be remembered, however, that the yellowness due to the collection of fat under the conjunctiva may be mistaken for that of jaundice. Also pigments sometimes form in the urine, which render it very dark; and now and then malingerers purposely stain the skin and add coloring matters to the urine.

It may be difficult to determine whether jaundice is of the obstructive or non-obstructive variety, but the latter, as well as its particular cause, may be generally recognized: 1. By the circumstances under which it occurs, and the other symptoms which accompany it. 2. By the discoloration being less marked. 3. By the presence of more or less bile in the stools. 4. By examination of the urine, which, accord-

ing to Dr. G. Harley, gives indications of the presence of bile-acids only in the obstructive form of jaundice, though many deny this; and which in the non-obstructive variety yields leucin and tyrosin.

The precise cause of obstructive jaundice is determined by: 1. The age, sex, habits, and general past history of the patient. 2. The preceding and accompanying symptoms, both local and general. 3. The rapidity with which the jaundice has set in and its intensity. 4. Careful physical examination of the abdomen. 5. The course and progress of the case and the effects of treatment. Intelligent attention to these points will generally lead to a correct opinion. The more rare causes can only be made out by exclusion, and are often merely guessed at. The fact of the gall-bladder being enlarged or not will as a rule show whether any obstruction involves the hepatic or common bile-duct.

PROGNOSIS.—In most cases the prognosis of jaundice depends rather on the morbid condition with which it is associated, than on this particular symptom. As a rule, therefore, it may be stated that non-obstructive jaundice is much the more grave. Typhoid and low nervous symptoms are highly dangerous; as are also hæmorrhages and signs of interference with the renal secretion. In obstructive cases not only will the prognosis vary with the cause of the jaundice, but also with the rapidity with which it comes on, its intensity, and mode of progress. In every case a cautious prognosis should be given, as it is never certain how it may turn out, and this is particularly true if jaundice sets in rapidly and becomes speedily intense. Catarrhal jaundice generally soon disappears. Of course when it is due to obstructive organic disease, especially cancer, there is but little hope of its removal; but it is astonishing to what an extreme degree the discoloration may attain in some instances, without any proportionate general disturbance to lead to the idea that bile acts as a poison. Jaundice in pregnancy is considered highly dangerous.

TREATMENT.—In general terms the management of cases of jaundice may be summed up thus: 1. To treat the condition upon which it depends, and remove any obstruction to the flow of bile, if practicable. 2. To promote secretion of bile, if necessary, by remedies to be hereafter considered; or on the other hand to limit its formation. 3. To attend carefully to the diet, especially avoiding fatty and oily substances, as well as much starch, sugar, or alcoholic stimulants. 4. To treat the symptoms due to the absence of bile from the alimentary canal, especially constipation and flatulence; or to supply a substitute for this secretion in the way of artificially-prepared inspissated ox-gall, gr. v—x, given two to three hours after meals. 5. To promote the renal and cutaneous excretions. 6. To attend to the general condition, giving quinine, iron, and other tonics, as well as adopting hygienic measures for improving the health in chronic cases; treating adynamic symptoms by stimulants; low nervous symptoms by encouraging free

elimination by the bowels, kidneys, and skin; hæmorrhages by astringents. In cases of permanent obstruction, it has been proposed to make an artificial fistula into the gall-bladder, having first excited adhesion with the abdominal wall by means of escharotics. The irritation of the skin may demand measures for its relief; alkalies with opiates or morphia internally, or the latter hypodermically, and warm and alkaline baths are most serviceable for this purpose. It must not be forgotten that the color of jaundice remains for a time after any cause of obstruction has been removed; and if this has been effected it is not necessary to continue further active measures. The removal of the bile from the system may be promoted by occasional alkaline baths, aperients, Cheltenham and other mineral waters; while convalescence is hastened by hygienic and other measures for improving the general health.

CHAPTER XLIV.

CONGESTION OF THE LIVER—HYPERÆMIA.

ETIOLOGY.—Active hepatic congestion occurs to some degree during every period of digestion. As a morbid condition it is met with: 1. After errors in diet, particularly in those who take but little exercise, especially habitual excess in eating, or indulgence in too rich articles; abuse of alcohol or hot condiments. 2. As the result of continued exposure to excessive heat in tropical climates; or of a sudden chill while heated. 3. In connection with malarial, yellow, relapsing, and other fevers. 4. Vicarious of menstruation; or, it is said, of habitual discharges, *e. g.*, bleeding from piles. 5. As the result of injury. 6. Associated with morbid deposits in the liver, and the early stage of inflammation.

Mechanical congestion is generally due to some condition of the heart or lungs which interferes with the general venous circulation; very rarely to local obstruction of the hepatic vein or inferior vena cava.

Passive congestion is said to follow habitual constipation; or to result from a torpid state of the portal system, due to paralysis of the coats of the vessels or any other cause.

ANATOMICAL CHARACTERS.—It is only the mechanical form of congestion that is generally seen after death. The liver is enlarged more or less, quite uniformly, its surface being smooth, and the capsule stretched. It often feels unusually firm. On section an excessive quantity of blood flows; the color of the surface is dark, sometimes even purple; and the vessels appear abnormally filled, becoming in time permanently dilated. The dark color is rarely uniform, but is evident

chiefly in connection with the intralobular branches of the hepatic veins, constituting the so-called *hepatic congestion*. *Portal congestion* is the term applied when the vessels at the circumference of and between the lobules are most distended, but this is rarely seen. The ultimate effects of long-continued mechanical congestion will be described in a subsequent chapter, but allusion may be made here to what is termed the "nutmeg liver." This morbid condition is thus named from a section of the organ presenting a variegated appearance, resembling that of a nutmeg, there being a mixture of red, white, and yellow tints. It is observed after congestion from cardiac obstruction has lasted for some time, and depends essentially on the following pathological changes. The branches of the hepatic vein are distended and overloaded, deep red, and well-defined; the circumference of the lobules corresponding to the portal branches is anæmic, and has undergone degenerative fatty changes, hence being pale and opaque; while the bile is stagnant in many of the smaller bile-ducts, which accounts for the yellow tint.

SYMPTOMS.—Locally hepatic congestion tends to produce a sense of uncomfortable tension, fulness, and weight, especially after meals and when lying on the left side; sometimes there is slight tenderness. There may be pain in the right shoulder. Slight jaundice is often present, but the stools contain bile. The spleen becomes enlarged in course of time in cases of mechanical congestion. Commonly the alimentary canal is deranged, as evidenced by impaired appetite, foul tongue, constipation or diarrhœa, and flatulence; but this is often the result of the same cause which originates the hepatic congestion, though it may be partly due to deficiency or unhealthy quality of the bile. Some general disturbance often accompanies the congestion. The urine is frequently deficient and concentrated, depositing abundant urates; it also commonly contains biliary coloring matter.

The *physical signs* of congested liver are moderate enlargement, liable to some variation; regularity and uniformity in shape, as well as over surface and margins; with frequently somewhat increased firmness.

TREATMENT.—For active congestion the measures to be adopted are to remove its exciting cause, an emetic being useful if it is due to irritating articles of food; to restrict the diet to small quantities of beef tea, milk, and such articles; to apply warm poultices, fomentations, or sinapisms over the hepatic region; or to dry-cup freely, or in some cases even to remove a little blood by leeching or cupping, or by applying a few leeches around the anus; and to give a dose of calomel or blue pill, followed by saline aperients, such as citrate of magnesia, sulphate with carbonate of magnesia, sulphate of soda, or cream of tartar. After the acute symptoms have subsided, alkalies with bitters are useful, as well as alkaline and saline mineral waters; subsequently the principles of treatment must be similar to those described hereafter in connection with chronic hepatic diseases. These will also apply to cases of mechanical congestion.

CHAPTER XLV.

ACUTE INFLAMMATORY DISEASES OF THE LIVER.

I. CIRCUMSCRIBED OR SUPPURATIVE INFLAMMATION—HEPATIC ABSCESS.

ETIOLOGY AND PATHOLOGY.—The usual form of acute inflammation of the liver-tissue is that which ends in suppuration, and even this is rare, except in tropical climates. The cases seen in this country are principally among sailors and others who have come from these regions. Murchison distinguishes two forms of hepatic abscess, the *tropical* and *pyæmic*, the latter occurring in temperate climates.

The general causes of acute hepatic inflammation may be stated as follows: 1. Occasionally direct injury to the liver or over the hepatic region. 2. Convection of septic matters from various parts of the body, either internal or external, the products of wounds, operations, abscesses, ulcerations or gangrene. The deleterious substances may come from any part, but hepatic abscess is especially frequent after ulceration or gangrene of the stomach or bowels; as the result of operations affecting the alimentary canal; and in connection with ulceration or suppurative inflammation about the bile-ducts or gall-bladder; because then the materials are immediately taken up by the portal system of vessels. Some are of opinion that in these cases the disease originates in phlebitis, extending along the portal vessels to the liver. 3. Occasionally the softening and breaking-down of an embolus or thrombus in the portal vein (*suppurative pyle-phlebitis*), the particles being conveyed into the liver and originating an abscess there. 4. Rarely some direct irritation in the substance of the liver, *e. g.*, a suppurating hydatid cyst; gallstones; round-worms which have entered through the ducts; or foreign bodies. 5. The etiology of *tropical abscess* requires special comment. It has been regarded by Budd and others as in all cases essentially pyæmic, resulting from previous dysentery. In some instances it is highly probable that this is the true pathology, but by no means in all, for there is often no sign whatever of dysentery. There are two views as to the *exciting causes* of the inflammation in these cases: *a.* That it is the direct consequence of continued intense heat, combined with malarial influence. *b.* That in addition to these influences, which induce a *predisposing* depraved condition of the system, there must be a sudden chill acting upon the body. Intemperance, excessive eating, and indolent and luxurious habits generally, act as powerful predisposing causes.

ANATOMICAL CHARACTERS.—The post-mortem examination in acute hepatitis generally reveals suppuration. It is supposed to commence with active hyperæmia; followed by effusion of lymph and degeneration of the hepatic cells, causing the affected part to become swollen or prominent, paler, yellowish, and softened; then suppuration begins in points in the centre of the lobules, which gradually coalesce, forming abscesses of various sizes. The pus-cells are probably partly leucocytes; partly the products of endogenous multiplication of the liver-cells. The situation, number, size, and exact shape of the abscesses vary widely; as well as the nature and amount of their contents; and the condition of the surrounding tissue. The right lobe is much more frequently affected than the left. Important differences as to number and size are stated to be observed between tropical and pyæmic abscesses. In the former case there is generally one large abscess, and rarely is the number above three; in the latter the separate accumulations of pus are very numerous and small, not often being above a hen's egg in size. My own limited experience of hepatic abscess would lead me to the conclusion that there are at least exceptions to this rule.

Originally hepatic abscesses are more or less rounded, but by coalescence and extension they often become very irregular. The contents generally resemble healthy pus at first, but in time they may become sanguineous or altered by admixture of bile, or more or less fetid and decomposed. At first the walls consist of liver-tissue, usually congested or infiltrated, softened, and ragged; in time the boundary may become converted into a smooth firm capsule.

The progress and termination of these abscesses are variable also. When large, and especially when of the tropical variety, they tend towards the surface of the liver, finally bursting externally; into the peritoneum, intestines, stomach, gall-bladder, hepatic duct, hepatic or portal vein, inferior vena cava, or pelvis of right kidney; or rarely passing through the diaphragm into the pleura, lung, or pericardium. After the discharge of the pus, cicatrization may take place, causing contraction and depression of the surface of the liver. In some cases an abscess remains dormant for a considerable period, and then rapidly extends. It is believed also that the fluid portion of the pus may be absorbed, the contents becoming caseous, then putty-like, and finally calcareous, the tissue around forming a dense cicatrix.

The gall-bladder is sometimes inflamed. The bile contained in it is frequently unhealthy, but presents no special characters. The consequences of the rupture of an abscess into various structures are described in other parts of this work.

SYMPTOMS.—As a rule the symptoms of hepatic inflammation are very prominent. They are *local* and *general*.

Local.—Pain and tenderness are generally complained of over some part of the hepatic region, often preceded by mere uneasiness. The

pain differs much in its severity and characters; in most cases it is at first dull, aching, and tense, but usually increases when suppuration sets in, and may then become throbbing; it is more marked when the inflammation is near the surface. Sympathetic pains about the right shoulder and scapula are occasionally present, but, it is stated, only when the upper surface of the right lobe is affected. Then also a deep breath or cough aggravates the pain; and the breathing is hurried, short, chiefly upper costal, while there is some sense of dyspnoea, with often a short dry cough. Jaundice is very uncommon in connection with tropical abscess, but some degree of it is frequently observed in pyæmic cases. Ascites is extremely rare, unless the inflammation depends on pyle-phlebitis, when signs of great obstruction of the portal vein are prominent, and this is important in diagnosis. More or less disturbance of the alimentary canal is almost always observed, such as loss of appetite, furred and irritable tongue, thirst, nausea or vomiting, constipation or diarrhoea. The urine is at first very markedly febrile; after suppuration it often becomes pale, copious, and deficient in urea.

Physical Characters.—The liver is at first uniformly and moderately enlarged. Should the abscesses formed be small and deeply seated, nothing further can be observed; but if one or more of them become large and superficial, then the following characters are presented: 1. The general enlargement increases considerably, and in addition a bulging prominence presents in some direction, or occasionally more than one. This is generally observed in the epigastrium or right hypochondrium; sometimes it causes distension of the lower part of the chest, with flattening of the spaces. 2. The general surface and margins of the liver usually feel smooth and regular, but occasionally from the projection of several small abscesses, or on account of peri-hepatitis, they are undulated and irregular. 3. The local bulging soon affords a sensation of elasticity and then of fluctuation, gradually extending and becoming more perceptible, surrounded often by a ring of inflammatory induration. No hydatid-fremitus can be felt. 4. The hepatic dulness is altered in outline as well as in area, and when the abscess tends towards the thorax, this is often one of the chief signs noticed. 5. Auscultation may reveal friction-sound over an abscess, due to peritonitis. It may also indicate invasion of the chest, and interference with the expansion of the right lung. 6. By means of the aspirateur pus may be obtained, and this is important for diagnosis in doubtful cases. I may mention that marked pulsation may be observed in connection with an abscess presenting in the epigastrium, conducted from the aorta and simulating aneurism. The spleen may be enlarged, but chiefly in pyæmic cases, and not as the direct result of the hepatic disease.

General.—Chills or rigors often usher in an attack of acute hepatitis, followed by more or less pyrexia, with considerable constitutional dis-

turbance. Suppuration is usually indicated by repeated rigors; fever of a hectic type, not uncommonly remittent or intermittent, with abundant sweats; and much prostration and wasting. Ultimately typhoid symptoms are very liable to arise, ending in low nervous disturbance and death. The constitutional symptoms are as a rule more severe in pyæmic than tropical cases.

COURSE AND TERMINATIONS.—The ultimate course of events will depend upon the progress of the disease. The symptoms may subside, and the abscess undergo retrograde changes, ending in a cure. Almost always, however, it tends to open in some of the directions already mentioned, and the corresponding symptoms may be readily gathered from a little consideration. When it approaches the surface, the abscess causes redness, œdema, and the other signs of superficial suppuration before it bursts. Most cases of hepatic abscess are fatal and rapid in their progress, but tropical cases may last six months or more; pyæmic forms are much the more fatal and speedy in their termination. Some cases go on for a long period and ultimately recover, the abscess discharging its contents and cicatrizing.

II. PERIHEPATITIS.

This term is applied to inflammation of the covering of the liver and Glisson's capsule, which is not uncommon as an acute affection, associated with peritonitis, or organic diseases of the liver; or resulting from injury or extension of inflammation from neighboring parts. It is also said to arise from a chill. It leads to exudation, with thickening, opacity and adhesions; occasionally pus is formed. The symptoms are pain over the liver, sometimes sharp, increased by cough and deep breathing, with superficial tenderness, but no particular derangement of the hepatic functions, or alterations in the physical characters of the organ. There is usually more or less pyrexia. If the affection is chronic; or if repeated attacks arise, as not uncommonly happens in syphilis or chronic heart diseases, there may be signs of obstruction of the portal vein or bile-duct, with atrophy of the liver.

III. INFLAMMATION OF THE BILE-DUCTS.

Catarrh of the bile-ducts is by no means an uncommon affection, being especially met with in children and old gouty persons. Its chief causes are extension of catarrh from the duodenum; hepatic congestion; irritation of the mucous membrane by gallstones, parasites, foreign bodies, and perhaps unhealthy bile, which may cause considerable inflammation; and blood poisoning in fevers and other affections. The morbid appearances are similar to those of other catarrhs. Occasionally croupous or diphtheritic inflammation is observed. The symptoms of simple catarrh merely indicate partial obstruction of the

bile-ducts, with consequent jaundice and enlargement of the liver and gall-bladder, generally preceded by signs of gastro-duodenal catarrh. There is often local pain and tenderness, with some pyrexia. The duration and course of these cases vary, but generally they soon recover.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

DIAGNOSIS.—The occurrence of acute local symptoms, connected with the liver, with constitutional disturbance, should lead to the suspicion of inflammation, especially in tropical climates, or if there is any obvious cause of pyæmia. At first there may be considerable difficulty in distinguishing inflammation from mere active congestion; and also in separating the different kinds of inflammation from each other, especially suppurative hepatitis and perihepatitis. When pus forms, this is generally revealed by evident physical signs, and increased constitutional disturbance. Commonly, however, distinct objective indications of pyæmic abscesses are wanting. The differences between these and tropical abscess have been already alluded to. The chief conditions which may be mistaken for abscess in the liver are inflammation and suppuration of the gall-bladder; a suppurating hydatid cyst; and abscess in the abdominal parietes. Local peritonitis may simulate hepatitis.

PROGNOSIS.—In the milder forms of hepatic inflammation the prognosis is generally favorable, but when suppuration occurs it is very serious. It will then depend mainly on the size and probable number of the abscesses; the direction in which they open, Maclean stating as his experience that the largest number of recoveries follows bursting into the lung, and then into the intestine, and that the prognosis is much more favorable when the abscess points at the ensiform cartilage than in an intercostal space; the general condition of the patient; and whether the liver-affection is associated with other morbid states, such as dysentery. Pyæmic abscesses are very fatal.

TREATMENT.—The slighter forms of hepatitis may be treated in the same manner as active congestion. Much difference of opinion is held as to the management of tropical abscess in its early stage. The usual measures recommended are venesection, or local bleeding by leeches or cupping; constant poulticing or fomentations; saline purgatives internally; and the administration of calomel. Dr. Maclean, who strongly opposes bleeding and mercury, advocates the free employment of ipecacuanha, as in dysentery. Tartar emetic and tincture of aconite have also been used. With regard to pyæmic abscess, there can be no question but that the severe lowering measures mentioned above are most injurious. When suppuration occurs, poultices and fomentations must be assiduously applied. The question of opening abscesses is one which is also much discussed. Most authorities seem to be in favor of operating; some prefer leaving the abscess to take its own course, on

account of the dangers of peritonitis, decomposition from entrance of air, hæmorrhage, or gangrene. If there is satisfactory evidence of the existence of a single abscess, it appears to me certainly advisable to let the matter out, and even in doubtful cases the aspirateur may be advantageously employed. When there are several collections of pus, as in pyæmia, operative interference is contraindicated. The different modes of evacuation advocated are by the aspirateur or a small trocar and canula; free incision; or application of caustic potash so as to produce a slough, this last being also used to excite adhesions to the abdominal wall. The air should be as carefully excluded as possible, and carbolic acid freely used. In the case of a moderate-sized abscess, it seems best to let out all the pus at once, and leave a canula or drainage-tube in; when very large, it may be emptied gradually by successive operations. Large poultices should be afterwards applied, being very frequently changed, and disinfectants freely used, the patient lying as much as possible in that position most favorable for the escape of the pus. It is useful in some cases to wash out the abscess with weak carbolic acid. In the early period of the disease the diet should consist of milk, beef tea, and such articles; when suppuration is set up it should be as nourishing as possible, while stimulants are called for at this time, as well as quinine, mineral acids, or tincture of steel. Narcotics are often required, and various symptoms demand attention in many cases. The general treatment for pyæmia is indicated in pyæmic cases.

CHAPTER XLVI.

ACUTE YELLOW ATROPHY.

ETIOLOGY AND PATHOLOGY.—The causation of this rare hepatic disease is very uncertain. Most cases occur in connection with pregnancy, but it has also been attributed to severe nervous disturbance from depressing emotions; blood-poisoning in typhus, scarlatina, and other fevers; malarial influence; or to the production within the body of some special poison, the product of faulty digestion or assimilation. The chief *predisposing causes* mentioned are age, the disease almost always being observed before 40, but never in childhood; the female sex; intemperance; venereal excesses, and syphilis.

As regards its pathology, most authorities consider acute atrophy as being the consequence of diffuse parenchymatous inflammation of the liver excited by some poison. It has also been attributed to obstruction of the smaller bile-ducts; or to excessive formation of bile in them, whereby pressure is exercised on the surrounding structures.

ANATOMICAL CHARACTERS.—The obvious characters are marked diminution in size and weight of the liver; relaxation of tissue and softening; change in color to a dull yellow; and disappearance of all traces of lobular divisions. The organ may be reduced to half its ordinary bulk, or even less, being especially diminished in thickness, and it lies out of sight at the back of the abdomen, shrunken and flaccid, while the peritoneum covering it is lax and often in folds. In parts where the disease is less advanced hyperemia and a grayish exudation have been described. Microscopic examination reveals fatty degeneration and destruction of the gland-cells, until nothing remains but a granular detritus, oil-globules, and pigment. There is only a little mucus in the gall-bladder and ducts as a rule. Extravasations of blood in the alimentary canal and other parts, with ecchymoses, are not uncommon. The spleen is generally enlarged. The kidneys exhibit degeneration of, and deposits of pigment in, the epithelium cells. Leucin and tyrosin are found in the blood, as well as in the tissues of the liver, spleen, and kidneys.

SYMPTOMS.—There may or may not be premonitory symptoms of gastro-enteric catarrh, or general uneasiness and painful sensations, but there is nothing characteristic about these. Slight jaundice is usually soon observed, and it afterwards increases, but seldom becomes intense, and it may be limited to the upper part of the body. It has been attributed to blocking up of the smaller ducts by the débris of the cells. Among the ordinary symptoms are pain and tenderness over the epigastrium and hypochondrium, vomiting, and constipation. There is not much pyrexia, but the pulse is often hurried and is liable to much variation, while the temperature is considerably raised in some cases towards the close.

The striking clinical phenomena in this disease, however, are those significant of the "typhoid state," with prominent nervous symptoms; great diminution or complete disappearance of the hepatic dulness; generally enlargement of the spleen; peculiar changes in the urine; and hæmorrhages. The nervous symptoms consist at first of headache, great depression, languor, irritability, and restlessness; speedily followed by low delirium, stupor, coma, twitchings, convulsions, with involuntary discharge of feces and urine. At the same time the tongue becomes brown and dry, with sordes on the teeth. The urine yields considerable quantities of leucin and tyrosin, while the urea, uric acid, and salts are much diminished, being sometimes almost entirely absent; some bile-pigment is usually present, and often a little albumen or blood. Hæmorrhage most frequently takes place into the stomach and bowels; cutaneous petechiæ and vibices are not uncommon, and in rare instances uterine hæmorrhage or epistaxis occurs. The course of the disease is generally very rapid, and the termination fatal.

When it arises in the course of pregnancy, it leads to miscarriage or abortion.

DIAGNOSIS.—At first it is difficult to diagnose acute atrophy of the liver, but once the symptoms are fully developed, with the physical signs of diminution in the size of the organ, the nature of the disease becomes evident.

PROGNOSIS is very grave, the disease almost always ending fatally.

TREATMENT.—Free purgation; promotion of the action of the skin by hot air or vapor baths; diuretics; blistering and leeching the head; and cold douches, have been the chief measures recommended, but they are of little service when the disease is established. Hæmorrhages and other symptoms must be treated as they arise.

CHAPTER XLVII.

CHRONIC DISEASES OF THE LIVER.

I. HYPERTROPHY AND ATROPHY.

A SIMPLE hypertrophy of the hepatic tissue is said to be observed in some cases of leucocythæmia; very rarely in diabetes; and as the result of prolonged residence in hot climates. Clinically it is indicated by a slow, moderate, and uniform enlargement of the liver; without any evident symptoms.

On the other hand, atrophy generally occurs in old age; or may result from starvation; or from pressure upon the surface of the organ by tight stays, peritoneal adhesions, and other conditions.

II. FATTY LIVER—HEPAR ADIPOSUM.

ETIOLOGY.—This affection belongs to the fatty infiltrations, the secreting cells becoming filled with oil. The conditions under which it is usually met with are: 1. In phthisis and other wasting diseases, such as cancer, gastric ulcer, chronic dysentery. 2. In chronic lung and heart affections, leading to imperfect aeration of blood. 3. As the result of over-feeding, especially excessive consumption of hydrocarbonaceous substances; and abuse of alcohol, particularly in the form of ardent spirits. Deficient exercise and indolent habits aid greatly in the development of the disease under these circumstances. Some individuals are much more predisposed than others. Fatty degeneration may be set up in connection with other morbid conditions of the liver, as albuminoid infiltration or cirrhosis.

ANATOMICAL CHARACTERS.—In well-marked fatty liver the morbid

characters include enlargement and increase in weight, though the specific gravity is diminished, the margins being thickened and rounded, and the surface quite smooth; a more or less yellow color, with opacity, both externally and on section, generally mottled with red; softening of the tissue, which has a doughy, inelastic feel, pits on pressure, and readily breaks down or tears; anemia, but little blood escaping from the cut surface; loss of distinctness of outline of the lobules; and evidence of the presence of much fat to the knife, blotting paper, or ether. The liver may yield as much as 43 or 45 per cent. of oily matters, which consist of olein and margarin, with traces of cholesterin. Microscopic examination shows enlargement of the cells, which become spherical, and more or less loaded with fat. In the less advanced cases the change is only thus revealed. It is found that the morbid process extends from the circumference of the lobules towards their centre.

SYMPTOMS.—As a rule there are no evident symptoms connected with the liver. Dyspeptic disturbances are common. *Physical examination* is the only positive means of diagnosing fatty liver: 1. There is enlargement in a downward direction, slow in its progress, and usually moderate in degree, the organ never attaining any great size. 2. The shape is quite normal, and the surface and margins are smooth and regular, the latter feeling rounded. 3. Palpation often reveals a soft, doughy consistence of the tissue. The general symptoms are frequently those associated with fatty changes, viz., want of tone; inaptitude for exertion; pallor and pastiness of the skin. Signs of fatty changes in other organs and tissues, as the heart, vessels, and kidneys, may be observed.

III. ALBUMINOID, LARDACEOUS, OR WAXY LIVER.

The *etiology* and *pathology* of this morbid condition have already been considered. The liver is one of the most common seats of albuminoid deposit.

ANATOMICAL CHARACTERS.—Commonly the size and weight of the liver are considerably increased, as well as the specific gravity. Shape is scarcely altered, but the liver is somewhat flattened, with rounded edges. The surface and margins are quite smooth, the peritoneum is stretched, and the tissue feels very firm and resistant. On section the usual pale, anemic, dry, grayish, and glistening aspect of lardaceous disease is observed; often the surface is quite homogeneous, without any trace of lobules, or these may appear enlarged. The ordinary chemical tests are yielded, and microscopic examination reveals the presence of the deposit in connection with the vessels and cells. It is first observed in the middle zone of the lobules, where the branches of the hepatic artery are distributed. The exact appearance may be varied by the association of other morbid conditions, such as fatty degeneration, cirrhosis, or syphilitic cicatrices. The disease commonly involves other organs at the same time.

SYMPTOMS.—As a rule hepatic symptoms are not prominent. Local sensations rarely amount to more than a feeling of weight, tension, and discomfort. Jaundice and signs of obstruction of the circulation are also very uncommon, and when present are due either to pressure by enlarged glands in the portal fissure, or by thickenings in connection with local inflammatory changes; or ascites may result from chronic peritonitis or constitutional debility and anæmia. The *physical signs* are: 1. Enlargement, chiefly in a downward direction, gradual in its progress, frequently very great at last, so that the liver presents a visible prominent tumor. 2. No perceptible alteration in form, the surface being smooth and uniform, with rounding of the margin. 3. Consistence dense and resistant, often extremely hard. There are the usual general symptoms indicative of albuminoid disease; with in most cases signs of implication of other organs; as well as of the existence of some constitutional condition with which it is associated.

IV. HYDATID TUMOR OF THE LIVER—ECHINOCOCCUS HOMINIS—ACEPHALOCYST.

ETIOLOGY AND PATHOLOGY.—The best illustration of the morbid conditions resulting from the development of the embryo of a tape-worm in the human body, is afforded by the complaint now under consideration; and though the parasite may be met with in almost every organ and tissue in the body, yet the liver is by far its most frequent seat, so that the subject may be treated once for all in the present chapter. A hydatid tumor is derived from the development of embryos of the *tænia echinococcus*, each of which produces a scolex, named *echinococcus hominis*, and these become inclosed in cysts. This tape-worm infests dogs and wolves, and it is supposed that fragments are evacuated in their excreta, their ova are set free, become mixed with water or food, and are thus introduced into the alimentary canal of a human being. When the embryos are liberated they bore the walls of the stomach with their hooks, and then migrate, usually settling in the liver, there developing into scolices. The echinococcus also infests sheep, and it is in consequence of eating their organs that dogs become the subjects of tape-worm.

Iceland is the country in which hydatid disease is especially prevalent. In this part of the world it is only very exceptionally met with, and usually in those who have been abroad. Most cases occur during middle life, and among the poorer classes.

ANATOMICAL CHARACTERS.—In the first place it will be well to describe the various structures which ordinarily enter into the formation of a typical hydatid tumor: 1. Externally there is a firm, whitish or yellowish, fibrous, vascular capsule, the result of proliferation of cellular tissue from irritation, which is adherent to the surrounding structures. 2. Within this, moulded as it were to its interior, but easily separated from it, is a delicate cyst or bladder, elastic, grayish, semi-

transparent or gelatinous in aspect, and compared to boiled white of egg; under the microscope it is seen to consist of several hyaline, concentric layers, a section presenting a characteristic laminated appearance. The most internal layer is extremely delicate and studded with minute transparent cells. The term *mother-sac* or *vesicle* is usually applied to this structure as a whole; but it has also been limited to the internal lamina just mentioned, which has likewise been termed the *germinal membrane*. 3. A quantity of fluid is contained within the cyst, usually completely filling it, perfectly colorless, transparent, and watery as a rule, occasionally slightly opalescent; of low specific gravity—1007 to 1009; generally alkaline or neutral, but occasionally acid; and consisting mainly of a strong solution of chloride of sodium, without any albumen or any organic substance, but said to contain succinate of soda. 4. Floating in this fluid, or attached to the inner surface of the mother-cyst when small, are numerous secondary or *daughter-cysts*, in some instances amounting to hundreds or thousands and completely filling the space, so that there is little or no fluid, and becoming flattened by mutual pressure, each having precisely the same structure as the mother-sac; within the larger of these there may be a third generation, and rarely a fourth. 5. When the walls of the sacs are examined carefully, little whitish, opaque spots are visible on the inner surface, which are the scolices of the echinococcus in various stages of development, usually arranged in groups or clusters, occasionally single. These may also be free in the fluid, making it somewhat opaque. Each scolex is very minute, measuring from $\frac{1}{10}$ th to $\frac{1}{4}$ th of a line in length, but this and the form vary according as the head is retracted into the body or extended. The head presents a proboscis, four suckers, with a double circle of characteristic curved hooks, which are movable and of unequal length; a constriction separates it from the body, the latter being striated longitudinally and transversely, and presenting posteriorly a depression with a pedicle, by which the animal is fixed to the sac in its early condition. Numerous round and oval calcareous particles are imbedded in the tissue.

In most cases there is but one tumor as above described, but sometimes there are two or more, though one generally predominates over the others. The size varies extremely, and the hydatid may attain such dimensions as completely to fill the abdomen and invade upon the chest. The daughter-cysts usually range from a millet-seed to an egg in size, but subsequent generations are very minute. Originally the shape tends to be spherical. The right lobe of the liver is the most frequent seat, but the cyst may occupy any part, deep or superficial. Necessarily if the hydatids are numerous, large, or superficial, they alter more or less the dimensions and form of the liver, giving rise to prominences. The surrounding hepatic tissue is often atrophied and compressed; sometimes the healthy portion hypertrophies. Peritonitis may be excited over the tumor, causing thickening and adhesions.

The events which are liable to happen in the course of hydatid disease are important, and may be summed up as follows: 1. The tumor enlarges, displacing adjoining structures and interfering with their functions, until it bursts in some direction, or is ruptured by violence or in some other way. The opening may take place externally through the abdominal or lower thoracic walls; into either pleura or lung, especially the right, which is the most common direction; pericardium rarely; peritoneum; stomach or intestines; gall-bladder or bile-ducts; hepatic vein or inferior vena cava. 2. Inflammation and suppuration sometimes occur, either spontaneously from rapid growth, from injury or operation, or from the entrance of bile. 3. If the hydatid is slow in its progress, it not uncommonly undergoes degenerative processes as it becomes older, and these may ultimately bring about a spontaneous cure. The entrance of bile is supposed sometimes to induce this result. The outer capsule becomes much thickened, firm, irregular,

opaque, and ultimately calcified partially or completely. This impedes further growth, and the contained hydatids compress each other, shrivel and dry up, and die. The fluid also thickens and becomes opaque; and, in short, fatty and calcareous degeneration take place throughout, until there only remains a putty-like débris, in which shreds of the vesicles and hooklets of the echinococci are imbedded, revealing the nature of the mass. Hæmatoidin crystals are often found in it, as well as usually much cholesterin. A cicatrix-like depression may finally be left. 4. Occasionally cysts are found in which there are no echinococci. The name *acephalocyst* has been applied to this condition, and it has been regarded as an abortive or sterile form of the parasite, in which the development is arrested, or as an earlier stage of its growth.

Allusion may be briefly made here to a very rare form of this disease, named *multilocular hydatid cyst*. The liver is found occupied by a mass, in some cases as large as a child's head or larger, consisting of a stroma of cellular tissue, usually altered considerably by fatty degeneration, in which are imbedded cells or alveoli of various sizes, inclosing a gelatinous substance, in which microscopic examination reveals fragments of the laminated membrane of hydatids, hooklets, or occasionally even perfect scolices, as well as abundant calcareous particles. The centre of this mass is very liable to undergo suppuration, thus altering its characters considerably. This arrangement of the tumor has been attributed to the embryos having been deposited in the lymphatics, bloodvessels, or ducts of the liver; or to the absence or early rupture of the external fibrous cyst, so that the parasites are able to grow and migrate in various directions, and may thus enter the different vessels.

Other organs and tissues are not uncommonly the seat of hydatid tumors along with the liver.

SYMPTOMS.—In general terms the ordinary clinical history of hydatid tumor of the liver may be summed up in the absence of any morbid sensations referable to this organ, or of any interference with its functions, or constitutional disturbance; while it presents a peculiar form of enlargement. The disease may be latent from first to last. Should the growth attain a great size, a sense of fulness and tension is often felt, and in rare cases jaundice or signs of portal obstruction arise, in consequence of pressure upon the ducts or veins, or through their being blocked up by hydatids. Surrounding structures may also be interfered with, especially the diaphragm and respiratory organs. Should the cyst rupture, the consequent symptoms depend on the direction in which this takes place, being in many instances very grave. If the opening is external, characteristic structures may be discharged. The occurrence of suppuration is indicated by the ordinary local and constitutional signs of hepatic abscess.

The *physical characters* of hydatid tumors demand particular attention. 1. The liver is increased in size, and this is generally the first thing which attracts notice. The growth is as a rule very chronic and imperceptible in its progress, but finally it may attain enormous dimensions, so as to give rise to a general enlargement of the abdomen, or it may invade upon the chest, causing it to bulge. 2. The form of the liver is altered, as evidenced by palpation and percussion; while there

is often an evident tumor in some part, especially the epigastrium or hypochondrium. Smaller prominences are sometimes felt along the margins or surface, causing lobulation and irregularity. 3. Any prominent hydatid tumor is generally quite smooth, and more or less elastic or fluctuating. 4. Hydatid-fremitus is often elicited very clearly. 5. In any doubtful case it is justifiable to make an exploratory puncture with the aspirateur, and remove some of the fluid, the physical and chemical characters of which are quite characteristic. Perhaps some of the microscopic structures may come away at the same time.

It must be remarked that the signs above described are modified considerably by the degenerative and other changes which are liable to occur in the cyst. The outer wall may feel hard and bony. If the case only comes under observation when the abdomen presents a general enlargement, it is by no means easy in many instances, except by the history, to make out where the growth originated.

The multilocular cyst is said to be distinguished by being nodulated, hard, and tender; by jaundice, ascites, and enlargement of the spleen being usually present; and by its tendency to inflame and suppurate. This variety may run a very rapid course.

V. CANCEROUS AND OTHER GROWTHS.

ETIOLOGY.—The liver is one of the most frequent seats of internal cancer, which may be either *primary* or *secondary*, the latter especially occurring after cancer of the stomach. It has sometimes been attributed to injury. Most cases are met with between 50 and 70 years of age, the disease being extremely rare before adult life. In some patients there is a hereditary taint. Dr. Walshe believes that hepatic cancer is more common among males, and such has been my own experience.

ANATOMICAL CHARACTERS.—Ordinarily hepatic cancer assumes the form of distinct nodules or tuberos masses, having characters intermediate between those of scirrhus and encephaloid, approaching more to one variety or the other in different instances. There is a wide difference as to size and number, the nodules being small at first, and gradually enlarging until they may reach the dimensions of a child's head or more. Commonly several are found, unequal in size, and by their coalescence considerable tracts of the organ are sometimes involved. Originally the shape is spherical, but when the masses reach the surface they become flattened or even depressed in the centre, so as to present shallow concavities or umbilications. As a rule they are not separated from the surrounding tissue by any definite structure, but occasionally there is a distinct cyst around a mass. Generally the consistence is moderately firm, but it may range from that of a soft, brainlike, semi-fluctuating substance to that of a hard, cartilaginous tissue, and the amount of cancer-juice which can be expressed will vary

accordingly. The color of a section is in most cases white or yellowish-white, more or less dotted and streaked with red from vessels, but it may be extremely vascular and dark-red, resembling "*fungus hæmatodes*." The proportion of cancer-cells and fibrous stroma in any mass, as observed under the microscope, depends on the variety to which it belongs.

The liver is enlarged in proportion to the number and size of the growths, being often extremely large and heavy, as well as irregular. Its tissues are more or less destroyed and compressed; the vessels and ducts are invaded upon or obliterated; and as a result jaundice and signs of obstructed circulation are often present. New vessels form, originating in the hepatic artery. Some observers describe the cancer as beginning in the centre of the lobules; others in the interlobular tissue. When a mass reaches the surface it excites limited peritonitis, with consequent thickening and adhesions. Neighboring tissues may be involved by extension; and the lymphatic glands in the portal fissure are often implicated.

The growth is sometimes extremely rapid, especially when the cancer is soft. Certain changes are liable to occur. The vessels of encephaloid cancer often give way, leading to extravasations of blood into the interior, which afterwards undergo changes, thus giving rise to unusual appearances. Very soft accumulations have burst into the peritoneum in rare instances. Degenerative changes frequently arise in the less rapid forms, in the way of caseation, or of atrophy with contraction, induration, and the formation of a firm cicatrix. A section frequently presents a reticulated appearance owing to fatty degeneration.

In exceptional cases hepatic cancer is infiltrated. Melanosis, cystic cancer, and colloid have been extremely rarely met with in the liver. Recent more careful observation has shown that some of the morbid growths generally described as cancer are composed of spindle-celled sarcoma; cysts derived from obstructed ducts, and erectile tumors have also been described.

SYMPTOMS.—Hepatic cancer is in the great majority of cases characterized by marked local disturbances, but it may be latent. At first merely a sense of discomfort and weight is experienced, soon, however, increasing to distinct pain and tenderness, which frequently become very severe, especially if the growth of the cancer is rapid, or if peritonitis is excited. The pain is often lancinating, shooting towards the back or shoulders, or over the abdomen. Jaundice and ascites are also common symptoms, being usually the result of obstruction of the main ducts and vessels by projections from the liver or glands in the fissure; ascites may be associated with chronic peritonitis. Once the jaundice begins it is usually persistent, and often becomes intense, but it may be temporary from catarrh of the ducts. The spleen is but rarely enlarged. The superficial abdominal veins are sometimes distended.

The *physical characters* of the liver indicative of cancer are: 1. Enlargement, frequently very great, rapid in its progress, and chiefly in a downward direction. 2. Alteration in shape and irregularity of outline, nodules or larger masses being felt or sometimes even seen along the surface and margins, which are not uncommonly umbilicated. 3. As a rule considerable firmness and resistance of the projections, though they occasionally have a soft elastic feel, or even yield a sensation of obscure fluctuation. 4. Occasionally friction-fremitus and sound during breathing, these being chiefly due to peritonitis.

Digestive derangements are necessarily present in most cases, and they frequently first attract attention. The cancerous cachexia is usually well-marked, with rapid wasting, debility, and anaemia. There may be pyrexia from time to time, sometimes considerable when the progress of the disease is rapid. Cancer is frequently present in other organs, either primary or secondary, especially in connection with the alimentary canal.

The progress of hepatic cancer is generally very rapid, and the disease is rarely prolonged beyond a year.

VI. CIRRHOSIS OF THE LIVER—CHRONIC ATROPHY.

ETIOLOGY AND PATHOLOGY.—Undoubtedly several distinct morbid conditions of the liver have been included under the term *cirrhosis*, which have totally different modes of origin. With regard to the genuine disease, it is usually considered as resulting from a chronic interstitial inflammation, extending into the minutest portal canals, and leading to proliferation of cellular tissue between the lobules; or, as some describe, to the formation of an exudation, which organizes and then contracts, with consequent pressure upon and obliteration of the vessels, and atrophy of the secreting elements. Some have attributed it to a constitutional diathesis characterized by the formation of a fibroid tissue in different organs and structures of the body, of which the morbid state of the liver is but a local development. While others still have regarded the disease as commencing in degeneration and destruction of the secreting cells, the ducts, vessels, and areolar tissue remaining, followed or not by proliferation of the latter. The important *exciting cause* of cirrhosis is abuse of alcohol, especially indulgence in ardent spirits on an empty stomach. Hence the common name "gin-drinker's liver." The alcohol being absorbed and circulating through the liver is considered either to set up inflammation or lead to degeneration of the cells, according to the view held as to the pathology of the disease. Cirrhosis, however, is certainly occasionally met with where there is no history of intemperance, and it has then been attributed to the influence of malaria or prolonged heat; abuse of hot condiments and various articles of diet; the circulation of products of faulty digestion; or to the extension of a localized peritoneal inflam-

mation. It is chiefly met with between 30 and 50 years of age, being rare in youth, and not common in advanced age. Males suffer more than females; and also those who from their occupation or in any other way are more exposed to the exciting cause.

ANATOMICAL CHARACTERS.—In the advanced stage of cirrhosis the morbid appearances are very characteristic. The liver is greatly contracted, wasted, and diminished in weight, sometimes even to $\frac{2}{3}$ or $\frac{1}{2}$ the original, especially the left lobe and edges, the latter being often reduced to a thin fibrous rim. The form is frequently somewhat rounded. The surface is very pale, and covered more or less with roundish prominences, varying in size from minute granules to projections or knobs $\frac{1}{4}$ to $\frac{1}{2}$ an inch in diameter or even larger, like hob-nails, hence the names “granular or hob-nailed liver.” They may be tolerably uniform in size, but are more commonly unequal. Local puckerings or depressions are often observed. The capsule is thickened, opaque, and inseparable, while local peritoneal adhesions and thickenings are almost constant. The consistence is remarkably dense, firm, tough, and leathery as a rule, which is best realized on making a section. This exhibits the same granular appearance as the surface, sometimes to a much more marked degree. The color is generally a mixture of dirty-white or grayish and yellow; the former being arranged in lines or bands of different widths, sometimes extending over considerable tracts; the latter, which varies in tint, being in some specimens bright-yellow, in others almost brownish, corresponding to the granulations. The name *cirrhosis* is derived from this yellow appearance. In extreme cases, however, but little of it is evident.

The intimate changes in structure and the microscopic appearances must now be considered. The white tissue is generally supposed to be made up mainly either of fully-developed fibrous tissue, or of young connective-tissue elements in process of development, chiefly resulting from proliferation. It has, however, been described as consisting in some instances of the remains of vessels, ducts, and other tissues which have not undergone destruction. Generally this material has numerous vessels running through it, which are stated by Frerichs to be derived from the hepatic artery. The yellow nodules correspond to lobules or groups of lobules which have not yet undergone complete disintegration. The color is chiefly due to stasis of bile, owing to pressure upon the minute ducts; it partly results, however, from fatty degeneration of the cells. A large proportion of these cells have been wholly destroyed, and most of those which remain are greatly altered, appearing shrunken or fatty, or containing pigment-granules. The degeneration begins at the circumference of the lobules, and extends towards their interior. The vessels also present important changes. Many of the smaller branches of the portal vein are compressed or obliterated, and its capillaries destroyed, so that injection of them from the main trunk is im-

possible. This and the larger branches are often dilated, and may be occupied by thrombi. Sometimes a considerable branch is compressed. The hepatic artery is also commonly dilated, and new capillaries form in the fibrous tissue; frequently black pigment is found in its branches. The chief divisions of the hepatic vein are not altered, but many of its capillary tributaries are obliterated, and the communications between it and the portal system more or less destroyed. The remaining capillaries are commonly in a state of fatty degeneration.

The degree to which the changes described are observed necessarily differs considerably according to the stage of the disease. In the earliest condition there can be no doubt but that the liver is enlarged, which is proved rather by clinical observation than post-mortem examination. At this time the granular appearance is absent or but slightly marked, while the entire organ is congested, and is described as being occupied by a succulent, vascular, grayish material, consisting of young connective-tissue. In exceptional instances, however, a cirrhotic liver is enlarged throughout, and even to a marked degree. This is generally due to its being associated with fatty or lardaceous disease, but not always.

The effects of cirrhosis outside the liver are highly important, and are visible on post-mortem examination, being mainly those already mentioned as resulting from obstruction of the portal circulation. Considerable anastomoses form between the hæmorrhoidal veins, and also between the superficial branches of the portal vein in the liver and the veins of the diaphragm and abdominal walls, through the peritoneal adhesions and along the suspensory ligament.

Similar changes to those observed in cirrhosis of the liver are not unfrequently met with in other organs and tissues at the same time.

A brief account will now be given of certain other forms of chronic atrophy:

1. As the result of long-continued mechanical congestion from heart disease, the liver contracts and presents characters much resembling those of true cirrhosis, but there is an important difference, and the atrophy is rarely so marked as in the latter. It results from pressure of the distended tributaries of the hepatic vein upon the contiguous cells, causing their degeneration; hence the centre of the lobules becomes first wasted and depressed, while the circumference remains and forms granulations. Ultimately extensive depressions are produced, and more or less proliferation of connective tissue occurs. Attacks of chronic perihepatitis are also common, which increase the tendency to atrophy.

2. Dr. Murchison describes a form of granular atrophy, generally independent of intemperance, in which the fibrous tissue is not increased, and the liver is softer than in health.

3. Atrophy may result from *adhesive pyle-phlebitis*, in consequence of

which the trunk or some of the branches of the portal vein are obliterated. Cicatricial retractions are observed on the surface, with corresponding indurations.

4. Another form is that due to chronic or repeated attacks of perihepatitis, which induces thickening of the capsule or pressure upon the vessels, while fibrous bands pass into the interior, but there is no granular appearance.

5. Syphilis not uncommonly leads to atrophy of the liver, either by exciting perihepatitis or simple interstitial hepatitis, or as the result of changes in gummatous deposits.

6. The last variety is named "red atrophy" by Rokitansky, or "chronic atrophy" by Frerichs. It may be associated with the deposit of pigment in the minute vessels of the liver, especially after prolonged or repeated attacks of malarial fever; or it sometimes follows ulceration in the alimentary canal. The entire organ is wasted, but it differs from true cirrhosis in the absence of any granulations on the surface; in a section being dark-brown or bluish-red and homogeneous, there being little or no indication of lobules; and in the consistence being less firm. The cells are often diminished in size and filled with brown pigment-granules. The ramifications of the portal vein are destroyed, its branches ending in cæcal, club-shaped extremities.

SYMPTOMS.—In all these different forms of contracted liver, the diagnostic clinical indications are derived from the evidences of interference with the portal circulation, and the signs afforded by *physical examination*. There are, however, in addition, symptoms resulting from derangement of the secreting functions of the liver, and others evidencing marked constitutional disturbance.

In the early stage of true cirrhosis it is customary to describe a train of symptoms which set in insidiously as a rule, but in reality they are merely those of congestion of the liver with gastro-enteric catarrh; and though it might be suspected that cirrhosis was being set up, should such symptoms arise associated with abuse of alcohol, there is nothing characteristic about them. Occasionally the disease begins with severe local symptoms, indicating acute hepatic congestion, catarrh of the ducts, and gastro-enteritis, accompanied with pyrexia. For a time there are physical evidences of enlargement of the liver. As the case advances more or less of the consequences of portal obstruction are observed, viz., ascites, often extreme in amount; enlargement of the superficial veins of the upper part of the abdomen, especially on the right side; gastro-enteric catarrh; hæmorrhage from the stomach or intestines; hæmorrhoids; and enlargement of the spleen. Digestive disturbances are usually prominent. Although painful sensations about the hepatic region are sometimes present in the early stages, when the disease is advanced there is rarely much uneasiness, if any; there may be tenderness, chiefly due to peritonitis or perihepatitis. Jaundice

also is but rarely a prominent symptom, being often quite absent, but more or less of it is observed in many cases from time to time, especially at the early period, mainly due to congestion, catarrh of the ducts, or pressure of enlarged glands. Extreme jaundice occasionally results from perihepatitis; or it appears towards the termination of a case, independently of any obstruction. The stools almost always contain bile.

Physical Characters.—Those usually noticed are: 1. Diminution in area of hepatic dulness in proportion to the contraction. 2. Granulation or nodulation of the surface, with a feeling of hardness; in short, the characters described under the morbid anatomy. Sometimes the edge of the liver can be grasped between the thumb and fingers, and the changes thus readily realized. 3. Occasionally friction-sound. Ascites often obscures the examination, but in such cases the organ can frequently be easily felt after paracentesis. It must be remembered that in some instances there is great enlargement of the liver, but the nodulated surface can then generally be readily recognized.

The constitutional disturbance is frequently very marked at last, there being considerable emaciation and weakness; a peculiar sallow, earthy complexion; a dry harsh skin; and flabbiness of tissues. Purpuric spots and blotches on the skin are sometimes visible, and there may be extensive ecchymoses, or hæmorrhages from mucous surfaces.

COURSE AND TERMINATIONS.—The progress of cirrhosis is generally very chronic, but it may run a tolerably rapid course from the first appearance of distinctive symptoms. The chief modes of death are from gradual asthenia and exhaustion, jaundice with typhoid symptoms, lung-complications, acute peritonitis, or hæmorrhage from the alimentary canal.

The other forms of contracted liver only differ clinically from that just described in the circumstances under which they arise, and in the physical characters presented by the liver to palpation, if the organ can be felt. In the variety due to perihepatitis, considerable pain and tenderness are generally complained of from time to time.

VII. TUBERCULOSIS.

Tubercle is usually observed in the liver only in connection with general acute miliary tuberculosis. Occasionally it is secondary to chronic tubercle in other parts. It may break down and form small cavities. Clinically it cannot be recognized with any certainty. The organ is usually enlarged.

VIII. SYPHILITIC DISEASE.

The morbid conditions of the liver which may result from syphilis are: 1. Lardaceous disease. 2. Perihepatitis. 3. Simple interstitial hepatitis, leading to general atrophy and induration. 4. Gumous

hepatitis, in which gummata are deposited more or less extensively, undergoing degenerative changes and becoming surrounded by a dense fibroid tissue, from which processes extend towards the surface in various directions. The liver-tissue becomes destroyed, and deep cicatricial depressions or furrows are seen on the surface, giving rise to a lobulated appearance. During life the characters of the liver may often be determined by physical examination, in the gummatous form being enlarged. There is often pain, with tenderness, and sometimes signs of obstruction of the bile-ducts and portal vein appear. The progress is usually very chronic.

CHAPTER XLVIII.

AFFECTIONS OF THE GALL-BLADDER.

THE morbid conditions to which the gall-bladder is subject can only be briefly indicated. Most of them cause enlargement of the organ, and it is important to be able to recognize the distinctive clinical characters of each form of enlargement.

1. **DISTENSION WITH BILE.**—When anything obstructs the common bile-duct, *e. g.*, a gallstone, the gall-bladder becomes filled with bile, and may attain enormous dimensions. There will be the usual signs of obstructive jaundice, with enlargement of the liver; while the gall-bladder is perceptible as a fluctuating tumor, sometimes reaching nearly to the iliac crest, and generally somewhat tender.

2. **ACUTE INFLAMMATION AND SUPPURATION.**—The mucous membrane of the gall-bladder is liable to simple catarrh, or to croupous or diphtheritic inflammation, like other mucous surfaces; but the important form of acute inflammation is that which is attended with the formation of pus in its interior, which particularly results from irritation by gallstones, or from obstruction of the cystic duct by these. It is clinically indicated by a very painful and tender fluctuating enlargement of the gall-bladder, which may ultimately assume the characters of an abscess, or even burst; accompanied with marked rigors and pyrexia, the latter tending to become of a hectic type. It is often preceded by signs of gallstones, but there is no jaundice or hepatic enlargement as a rule.

3. **CHRONIC INFLAMMATION.**—**HYDROPS VESICÆ FELLEÆ.**—**DROPSY OF THE GALL-BLADDER.**—If the cystic duct is obstructed for a long period, the gall-bladder may become gradually dilated by the accumulation of a clear, serous, or synovial-like fluid, the product of unhealthy secretion by the mucous surface, probably partly the result of chronic catarrh; while the walls become much thinned and atrophied. The organ is more

or less distended, often to an extreme degree; but there is little or no pain or fever: while jaundice is absent, and the liver is not enlarged. Occasionally the course of events is different. The liquid portions of the contents of the gall-bladder become absorbed, leaving an inspissated substance in which calcareous salts are deposited: the walls undergo thickening and contraction from chronic inflammation; and ultimately a firm puckered mass is left, inclosing a chalky pulp.

4. ACCUMULATION OF GALLSTONES.—Gallstones are often present in the gall-bladder without affording any evidence of their existence. In some instances, however, especially when they are very numerous and large, they cause local uneasy or painful sensations, increased after food or after much exertion or jolting; as well as reflex disturbance of the stomach and other parts: and sometimes much constitutional discomfort and depression. Occasionally also they give rise to severe symptoms from time to time, by attempting to enter the cystic duct and then falling back into the gall-bladder. They may also excite inflammation or ulceration of the mucous surface, the latter ending sometimes in perforation, or giving rise to pyæmia. In rare instances such a number of calculi collect that they form a tumor even of considerable size, having the general characters of enlargement of the gall-bladder as regards position, shape, and mobility, but with the following distinctive characters: 1. The tumor feels hard and sometimes nodulated. 2. On palpation a peculiar sensation is experienced, owing to the rubbing together of the calculi, compared to that produced by grasping nuts or pebbles. 3. A corresponding sound may be heard on auscultation: and occasionally loud rattling is perceptible on shaking or moving the patient. Now and then local peritonitis is excited by this enlargement, so that it becomes adherent and fixed. When such a tumor exists there are necessarily more marked subjective sensations, such as weight and uneasiness, especially on moving from side to side. The course of these cases and the growth of the enlargement are very slow.

5. CANCER.—The signs of this rare disease are: 1. Lancing pains with much tenderness in the region of the gall-bladder. 2. A tumor, having more or less of the characters of enlarged gall-bladder, but usually feeling firm, resistant, irregular, and nodulated, without the peculiar sensation of gallstones: being adherent and fixed; and growing rapidly. There are always evidences of cancer in other parts, with well-marked cancerous cachexia. A fistulous communication with the intestines is often formed. Gallstones are usually present. Jaundice and vomiting are common symptoms.

CHAPTER XLIX.

GALLSTONES—BILIARY CALCULI—CHOLELITHIASIS.

ETIOLOGY AND PATHOLOGY.—There is considerable uncertainty as to the mode of origin of gallstones. The chief views may be thus stated: 1. That they are merely the result of inspissation and concentration of bile. 2. That they depend upon certain biliary ingredients being in excess, especially cholesterin and coloring matters. 3. That the bile has some abnormal chemical composition, either when first formed or as the consequence of subsequent changes, which prevents it from holding certain elements in solution, and hence they are deposited. Thus calculi have been attributed to deficiency of soda, with excessive acidity; excess of lime, causing a separation of pigments; decomposition of the salts of soda with the biliary acids; or decomposition of the latter, with consequent precipitation of cholesterin and pigment. 4. That they originate in plugs of mucus, epithelium, or foreign bodies, upon which the ingredients of the bile are afterwards deposited. It is highly probable that each of these views is correct in different cases, and, when once the formation of a gallstone has commenced, its increase may be due to some other cause than that which originated it. There can be no doubt but that a catarrhal state of the gall-bladder and ducts favors the production of calculi, either by inducing stagnation, or, as some believe, by the mucus then formed favoring decomposition of bile, or impregnating it with carbonate of lime. This decomposition has also been attributed by Thudichum to the absorption of some ferment from the intestines.

There are some important *predisposing causes* of gallstones, viz., advanced age; the female sex; sedentary habits; habitual constipation; over-indulgence in animal food and stimulants; and organic diseases of the liver, gall-bladder, or ducts, interfering with the escape of bile. They have also been attributed to drinking water containing excess of lime.

ANATOMICAL CHARACTERS.—By far the most frequent original seat of biliary calculi is the gall-bladder, but they may be found in any portion of the ducts, or even in the liver itself. The number varies from one to hundreds or thousands; usually several are found. There is also a wide range as to size, this being in an inverse ratio to the number; several are sometimes cemented together, so as to form a large concretion. Originally most of the calculi are round or oval, but when numerous, owing to mutual friction they become worn and angular, presenting flat or concave facets, or occasionally actual articulations.

When formed in the ducts they exhibit curious shapes, being branched or coral-like. As a rule gallstones have a brownish or greenish-yellow color and are opaque, but they present an endless variety of tints, from white to black, blue, green, red, and other colors, according to their composition; occasionally they are somewhat translucent. They frequently have a greasy or saponaceous feel, with a waxy, brittle consistence, being readily cut or crushed; sometimes they are very firm. Most of them sink in water when recent, but some float, and most will do so after having been dried. The structure is rarely homogeneous and uniform. In the majority of cases, after a calculus has existed for some time a section reveals distinctly three parts, named from within out—the *nucleus*, of which there may be more than one; the *body*, which is often in concentric layers, or presents a radiated appearance; and the *cortex* or *crust*, this being usually smooth externally, but occasionally wrinkled, rough, or tuberculated and warty. As a rule the layers become lighter in color from the centre towards the circumference, but not always. Sometimes a fracture presents a crystalline aspect. The chemical composition is very variable, but the most common ingredients are cholesterin and bile-pigments, with a little lime or magnesia. To these may be added biliary and fatty acids, generally combined with lime; modified bile-pigments; phosphates; carbonates; salts of soda or potash in small proportions; and metals (iron, copper, and manganese). The nucleus is often made up of mucus and epithelium, and the former may unite the different parts. The appearances differ according to the composition, which is not necessarily uniform even in the same layer. It is quite impossible to describe the characters corresponding to the various ingredients, but it may be stated generally that in proportion to the amount of cholesterin a calculus contains it is whiter, more transparent, crystalline or radiated and lamellar, and of lighter specific gravity.

Biliary sand or gravel is not uncommonly met with, consisting either of cholesterin, bile-pigment, or black pigmentary matter.

The morbid conditions which are liable to be set up by gallstones may be stated as follows: 1. Irritation, inflammation, suppuration, or ulceration with consequent pyæmia or perforation, of the gall-bladder or ducts, perforation taking place in different directions, especially into the stomach, duodenum, peritoneum, or externally through the abdominal wall, and rarely into the colon, portal vein, pleura, pelvis of the right kidney, or vagina. Permanent fistulæ may be left. 2. Inflammation and abscesses in the liver, if lodged there; or formation of a cyst around the calculi. 3. Obstruction of some of the ducts in the liver, or of the hepatic, cystic, or common duct, with the usual consequences. 4. Obstruction of the intestines by a large calculus, this having probably entered through a fistulous communication from the gall-bladder.

5. Inflammation, ulceration, or gangrene of the bowel, with consequent perforation.

SYMPTOMS.—It is only needful here to describe those symptoms which indicate the passage of a gallstone along the duct to the intestine—*biliary* or *hepatic colic*—these being usually severe, but not always. The attack begins with a sudden intense pain in the right hypochondrium, in some cases most excruciating, often coming on just after a meal or after effort; it is described as constricting, griping, tearing, burning, or boring, and shoots over the abdomen, round the side, to the back, or towards the right shoulder. The patient is doubled up and rolls about, just like in ordinary colic, groaning or screaming and pressing upon the abdomen, which gives some relief, there being generally no tenderness at first. The pain may subside, leaving a dull aching, but urgent paroxysms come on again at intervals. The attacks are accompanied with much exhaustion; signs of collapse; a distressed and anxious expression of countenance; faintness, which may end in actual syncope; and cramps of the abdominal muscles; but no pyrexia. Sympathetic vomiting is frequently present, and sometimes hiccough. Among occasional symptoms are spasmodic tremors or actual convulsions, and marked rigors. In the course of a day or two, should the gallstone reach the common duct, there are, as a rule, the usual signs of obstructive jaundice, which may become intense, its duration depending upon that of the obstruction. When the calculus reaches the duodenum the suffering generally subsides suddenly, with a feeling of intense relief, and then the jaundice gradually disappears. In the great majority of cases biliary calculi pass on by the bowels and are discharged in the fæces, sometimes in great numbers, without producing any further mischief, and they may be detected by washing the stools through a sieve or through muslin. Very rarely they pass into the stomach and are vomited.

There are a few points of practical import which require notice. The intensity of the pain is by no means necessarily in proportion to the size of a gallstone, but rather to its angular shape. It usually diminishes when the concretion reaches the common duct, because this is larger than the cystic duct, but it increases again as the orifice is approached. Jaundice is not a necessary accompaniment, or it may be but slight, because when the calculus is angular it leaves room for the bile to flow by, or its passage is sometimes too rapid for the appearance of jaundice; on the other hand this may become permanent and extreme, owing to the permanent impaction of a gallstone. It is very important to look for the calculi in the stools, as by their shape, number, and size an opinion can often be arrived at as to whether any remain behind, as well as of their characters. After one large gallstone has escaped, other smaller ones often follow without causing any particular disturbance. Sometimes the pain subsides, but no calculus

is passed, because it returns to the gall-bladder. Pain and soreness may remain after the escape of a concretion into the duodenum, owing to nervous irritability on the part of the patient, or to local irritation of the nerves; or inflammation may be excited, indicated by pain and tenderness, with fever. The symptoms of hepatic colic are occasionally merely due to the passage of grit or inspissated bile. An attack may end fatally from the mere intensity of the pain and collapse, quite irrespective of the serious morbid changes which a gallstone is liable to set up, any one of which may cause death.

CHAPTER L.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF CHRONIC HEPATIC AFFECTIONS.

I. DIAGNOSIS.

THE main elements in the diagnosis of chronic hepatic diseases, both from other affections and from each other, are as follows: 1. The general history of the patient may reveal some known cause of certain liver complaints, especially abuse of alcohol; over-eating, with deficient exercise and general luxurious habits; prolonged residence in tropical climates or malarial districts; the previous occurrence of dysentery or ague; or syphilitic infection. Family history may afford some aid in diagnosis, especially if indicating a cancerous taint; in some cases the age and sex of the patient also deserve consideration. 2. The constitutional condition is highly important. Thus there may be some disease with which lardaceous or fatty liver is likely to be associated; or signs of the cancerous cachexia, syphilis, or cirrhosis may be evident. On the other hand, the absence of any constitutional disturbance is sometimes serviceable in diagnosis. 3. The presence or absence of symptoms referable to the liver, as well as their nature, intensity, and the history of their progress, also deserve careful attention, especially as regards pain and tenderness; jaundice; ascites and other evidences of portal obstruction. 4. Physical examination is of course highly valuable. This will be presently more fully alluded to. 5. The state of other organs may afford much aid, especially by revealing local manifestations of some constitutional disease, *e. g.*, cancer in the stomach, waxy kidney; or of some morbid condition with which hepatic derangement is likely to be associated, especially ulceration in the alimentary canal, gastro-enteric catarrh, or a disease of the heart which obstructs the circulation. 6. The rapidity of the progress of a case up to the time it

is first seen, as well as its subsequent course, with the results of treatment are to be taken into account in doubtful cases.

Physical examination demands special attention, particularly in detecting and making out the characters of enlargements or contractions of the liver; and enlargements of the gall-bladder. For differential diagnosis of hepatic enlargements, the following points must be noted, and in the description of each individual disease an endeavor has been made to arrange the characters in the same order: *a.* The extent, direction, and rapidity of growth. *b.* Whether the liver is normal in shape and outline, or presents outgrowths or irregularities. *c.* The conditions of the surface and margins as to smoothness, nodulation, etc. *d.* The consistence and other sensations afforded by the liver generally, as well as by any special prominences, including fluctuation and hydatid fremitus. *e.* Whether there is any evidence of local peritonitis, indicated by friction-fremitus or sound, or adhesions to the abdominal wall. *f.* Now and then it is requisite to use the aspirateur. The characters to be observed in connection with contractions of the liver and abnormal conditions of the gall-bladder have been sufficiently indicated in their respective descriptions. It is only necessary to add with regard to the gall-bladder, that it should always be noticed whether this is altered alone or along with the liver, and *vice versa*.

It may be useful to enumerate the causes of enlarged liver. The ordinary forms are due to—1. Congestion, especially mechanical. 2. Accumulation of bile from any obstruction in the ducts. 3. Albuminoid disease. 4. Fatty infiltration. 5. Hydatid cysts. 6. Cancerous and other growths. 7. Hepatitis, especially when ending in suppuration. 8. Cirrhosis in its early stage; and in very exceptional instances even when advanced. As very rare causes may be mentioned. 9. Simple hypertrophy. 10. Syphilitic gummosis hepatitis. 11. Tubercle. 12. Lymphatic growths. 13. A peculiar enlargement associated with vitiligoidea.

The chief practical difficulties in making out a diagnosis which have come under my notice are as follows: 1. Hepatic enlargement, and sometimes even changes in shape and other characters, may be simulated by the normally large size of the organ in children; congenital malformation; pressure by a rickety or otherwise deformed thorax, or as the result of tight lacing; depression by various morbid conditions in the chest, especially pleuritic effusion and tumors; elevation towards the chest by abnormal conditions in the abdomen. On the other hand they may be obscured by distension of the colon with gas, which may even give rise to signs simulating atrophy. 2. Morbid states of other structures often give rise to signs of hepatic derangement; or, on the contrary, they may put these in the background. Thus, enlargement of the liver may be simulated by a rigid and contracted state of the right rectus muscle; inflammation and suppuration in the abdominal

walls; accumulation of feces in the colon; or a tumor in connection with the right kidney, suprarenal capsule, or peritoneum. Again, a neighboring disease, particularly scirrhus of the head of the pancreas, often interferes with the escape of bile from the liver, and thus leads to its enlargement, with jaundice. The coexistence of ascites or chronic peritonitis with effusion frequently renders physical examination unsatisfactory. The use of the aspirateur is then most serviceable in order to remove the fluid; and also the plan of making sudden pressure over the liver. Not uncommonly liver disease is obscured by symptoms referable to a morbid state of some other organ, *e. g.*, cancer of the stomach; and it often itself gives rise to serious disturbance of the alimentary canal. Occasionally the liver is enlarged along with other organs and structures in the abdomen, particularly in cases of cancer, and then it is frequently impossible to make out distinctly what parts are involved. 3. Sometimes the liver becomes so enormous, especially in hydatid disease, as to fill the abdomen, and hence it becomes impossible to tell exactly where the enlargement commenced. In such cases the history of its growth, as to what region it started from, and perhaps its greater prominence about the hepatic region, may clear up the difficulty. 4. In some instances the liver is affected with two or more morbid conditions, the signs being modified accordingly, *e. g.*, cirrhosis with fatty or albuminoid disease. With regard to individual diseases, it may be mentioned that hydatid tumor is liable to be confounded with distended gall-bladder; soft cancer; right pleuritic effusion; abscess which has become somewhat chronic; aneurism; cystic disease of the kidney; or hydatids outside the liver. Cancer may be simulated by syphilitic disease; waxy liver, especially if combined with cirrhosis, or if some parts of the liver are more affected than others, so as to give rise to local projections; other forms of cirrhosis attended with enlargement; multilocular hydatid disease.

It is requisite to make a few remarks relative to pain referred to the hepatic organs. This may be simulated by painful affections of the superficial structures, either muscular or neuralgic; gastric and duodenal disorders, either functional or organic; intestinal colic; accumulation of feces in the colon; aneurismal, pancreatic, and other tumors pressing on the nerves; the passage of a renal calculus; pleurisy; the pain met with in hypochondriasis; or local peritonitis. The attacks due to the passage of a gallstone are generally clearly indicated by the individuals in whom they occur; the past history; and the symptoms present, especially when these are followed by jaundice and the escape of calculi in the stools. It must be borne in mind that gallstones are not uncommonly formed in connection with organic disease of the liver or gall-bladder. Simple hepatalgia is difficult to make out positively. Its characters have already been indicated.

II. PROGNOSIS.

The prognosis in the case of a chronic hepatic disease depends mainly upon its nature; the degree to which the functions of the liver are interfered with, the escape of its secretion prevented, and its circulation impeded; the constitutional condition; the state of other organs; the possibility of removing any causes which may be keeping up the disease; and the results of treatment. Fatty and lardaceous disease are very slow in their progress, and in many cases do not seem to hasten a fatal issue materially, though they are but little amenable to treatment. Cancer is necessarily fatal, and is frequently very rapid in its course, especially when of the softer kind. Hydatid disease is markedly chronic, and usually unattended with danger; while it may be cured in many cases by appropriate treatment. It occasionally proves dangerous by rupturing; becoming inflamed and suppurating; or by some of its contents being discharged into the bile-ducts, blocking them up. Syphilitic liver can frequently be much improved by early and proper treatment. The different forms of atrophy are generally serious as regards their ultimate prognosis, though usually slow in their progress. I desire, however, again to draw attention to the fact, that in cases of cirrhosis, if the ascites can be permanently got rid of, a result which may not uncommonly be attained, the patient may be restored to comparatively good health and live for many years, engaging in the ordinary avocations of daily life, even in cases which appear to be almost hopeless. It must be remembered that serious and sometimes rapidly-fatal hæmorrhage from the alimentary canal is liable to occur in cirrhosis. From the account given of gallstones, it will be evident that there are many dangers attending them. Examination of any calculi passed, as to size, number, and shape, will aid in determining whether any remain, and whether the attacks of hepatic colic are likely to recur.

III. TREATMENT.

The management of cases of chronic hepatic disease needs to be conducted according to very obvious principles.

1. The diet needs careful supervision. It often has to be adapted to the constitutional condition, and therefore of a nutritious character, containing abundant protein elements; but it should always be as simple and easily digestible as possible, and particular caution is requisite in the use of alcohol, hot condiments, fatty, amylaceous, and saccharine substances, and rich articles of diet generally. In many cases it is highly important to forbid all stimulants, or only to allow light wines, and if spirits are ever needed, they should be given much diluted and in restricted quantities. Any one who is accustomed to indulge in excess of alcohol, and particularly in ardent spirits, must be impressed

with the absolute necessity of relinquishing such habits. It is desirable to recommend the patient to take much salt with food.

2. Hygienic management is of much consequence in some cases. In addition to the ordinary measures for improving the general health, the points which claim special notice are removal from a tropical climate or malarial district; cessation of sedentary and luxurious habits generally; a sufficient amount of exercise in the open air being taken daily; and the maintenance of free excretion of the skin by the aid of baths.

3. Treatment directed against some constitutional morbid condition often proves highly serviceable, and may have a direct effect upon the liver, which applies particularly to fatty, larlaceous, and syphilitic disease. General tonic treatment and remedies for improving the quality of the blood are beneficial in many cases, such as the various preparations of iron, strychnine or nux vomica, mineral acids with bitters. Tincture of iodine well-diluted; iodide of potassium or iodine; and muriate or carbonate of ammonia, have been found by different observers to influence the size of larlaceous liver. Of course mercury and iodide of potassium are the remedies for syphilitic disease.

4. The chief medicines which are believed to act immediately on the liver, influencing its secretory functions, and hence named *hepatics*, are mercury, particularly in the form of blue pill, calomel, and gray powder; podophyllin; nitric and muriatic acids, either externally or in the form of baths; and taraxacum. Rutherford has found from recent experiments that rhubarb considerably increases the flow of bile. Numerous observations have been made with regard to the effects of mercury and podophyllin, and the conclusion arrived at appears to have been that they rather diminish than increase the amount of bile in health. Still clinical observation affords evidence that in certain morbid conditions, when the bile is deficient, these remedies do decidedly increase it. This is probably due to their aiding in removing some impediment to the formation of bile, or in promoting its discharge. Murchison remarks respecting mercury, that it probably irritates the upper part of the small intestines, so that the bile is propelled onwards instead of being reabsorbed. The best plan of administering this drug to an adult is to give occasionally a tolerably full dose of calomel or blue pill, either alone or combined with rhubarb, colocynth pill, and extract of henbane. For children gray powder answers best. It is certainly injurious to get into the habit of constantly taking these medicines. A dose of podophyllin now and then is also frequently very serviceable. A mixture containing nitro-muriatic acid with extract of taraxacum enjoys considerable repute, especially in congestion of the liver and the earlier stages of cirrhosis, but probably these medicines act mainly through their direct action upon the alimentary mucous membrane. Sir Ranald Martin recommended the nitro-muriatic acid bath $\mathfrak{z}\text{i}$ of strong nitric and $\mathfrak{z}\text{ij}$ of hydrochloric to a gallon of

water at 90° to 98° F.), in which the feet are placed, and then the inside of the upper and lower extremities and the abdomen are sponged over freely. This bath seems to be of much benefit to those who come from tropical climates suffering from disordered liver.

5. Symptoms referable to the alimentary canal commonly call for treatment in connection with liver diseases, such as those due to gastric or enteric catarrh, constipation, flatulence, hæmorrhage; or there may be organic disease at the same time affecting the stomach or intestines, such as cancer. These conditions must be treated by the usual remedies, especially by alkalies and their carbonates, citrates, tartrates, and other vegetable salts; different bitter infusions or tinctures; saline aperients; and saline mineral waters, either English or continental. It is very desirable to keep the bowels as regular as possible, though not by employing strong purgatives. Should the patient be suffering from hæmorrhoids, confection of senna or sulphur is valuable.

6. The two prominent symptoms so frequently calling for treatment in liver affections, viz., jaundice and ascites, have already been fully considered. I cannot, however, refrain from again insisting upon the importance of having recourse to the early and repeated removal of fluid by paracentesis in ascites associated with cirrhosis.

7. Local applications are frequently of service especially to relieve pain and congestion. They include chiefly dry heat; poultices and fomentations, to which anodynes may be added; sinapisms; anodyne plasters; dry cupping or the removal of a little blood by leeches or cupping.

8. It is desirable to look to other organs, and direct treatment to them if required, particularly the heart, a diseased condition of which may be the immediate cause of hepatic symptoms. The kidneys must also be attended to.

9. The treatment of hydatid tumor requires separate consideration. For the cure of this complaint operative interference is needed, no known drug having any influence upon the parasite, and a spontaneous cure being extremely rare. It is only, however, when the growth attains some size and becomes a source of trouble that this course of treatment should be adopted, though it should not be delayed too long. There is much difference of opinion as to the most efficient plan of operation. The principal methods advocated are: 1. Puncture with the aspirateur, or a trocar and canula, and evacuation of the fluid. 2. Puncture and subsequent injection of the cyst with some irritating liquid, such as bile or tincture of iodine, so as to excite inflammation. 3. Removal of the contents through a large incision. 4. Gradual opening of the cyst by the repeated application of caustic potash to the abdomen over the most prominent part of the tumor. This has been done with the view of causing adhesions and thus preventing the escape of fluid into the peritoneum, and it has also been had recourse to with the same object pre-

vicious to puncture with the trocar. 5. Puncture of the tumor with needles and transmission of electric shocks through it. Some authorities assert that all that is necessary is to evacuate the fluid, and then the parasite will die. Others consider that it is necessary to excite inflammation. The balance of evidence seems to be certainly in favor of the more simple methods. Some recommend the employment of a very small trocar, others of a large one; again, there is a difference of opinion as to whether it is requisite to remove the whole of the fluid or not, some even using an exhausting syringe to draw it off. Murchison advocates the employment of a very fine trocar, and advises that the canula should be removed before the whole of the fluid has been drawn off, or as soon as it ceases to flow in a full stream, first passing a wire through the tube to see that it is not stopped up by a hydatid vesicle. The object of this is to prevent the entrance of air, which is one of the main dangers, as it tends to set up suppuration. Another danger is the escape of fluid into the peritoneum, and in order to prevent this, pressure should be made over the punctured portion of the abdomen during the removal of the canula. The opening should be made over the most prominent part of the tumor. Chloroform is not advisable, but local anaesthesia may be induced. After the operation the opening is to be closed with lint steeped in collodion, a compress and bandage being applied over this. Absolute rest is necessary for two or three days, and an opiate should be given at once and repeated if necessary. The fluid may collect again, and it may be requisite to repeat the operation. Murchison, however, cautions against doing this too soon, as the enlargement may be due to inflammatory effusion. In cases which are ultimately successful a considerable degree of fulness may remain for some months. Should the tumor be very large, the walls are likely to be thicker and less elastic, and then it appears better to use a large trocar. A free incision is only admissible when suppuration has taken place, or a large trocar may be then used and an elastic tube left in, the cyst being washed out with carbolic acid solution. The different events which may happen in connection with hydatid tumors must be treated on ordinary principles. In those countries where hydatid disease is prevalent prophylactic measures are necessary, viz. to prevent dogs from feeding on the offal of sheep; exclude them from slaughter-houses; give them meat thoroughly boiled; destroy their excreta which contain tape-worms; and to physic them periodically. (Murchison.)

10. The treatment of gallstones also calls for a few remarks. During the passage of a gallstone the chief measures to be attended to are: *a.* To administer narcotics and anodynes, especially opium or morphia, in full doses, subcutaneous injection of the latter being very valuable; belladonna; hyoscyamus; chloroform and ether, either internally or by inhalation. *b.* To treat certain symptoms, especially vomiting and

collapse. c. To apply dry heat, hot fomentations, poultices, or anodyne applications constantly over the hepatic region; or to put the patient in a warm bath. Antimony and other emetics, which were formerly much employed, as well as strong purgatives, ought to be avoided, in my opinion. Much good is effected in some cases by the treatment introduced by Dr. Prout, of drinking a considerable quantity of a warm solution of bicarbonate of soda (℥i or ℥ii to Oj). Large warm enemata may also be beneficial. The application of a few leeches over the hepatic region seems to be useful in prolonged cases, especially if there is much tenderness. For the prevention of gallstones attention to diet and hygiene is most essential; and the use of remedies which improve the state of the alimentary canal, or of those which act on the liver, is also often very serviceable. It has been supposed that they can be dissolved after their formation by means of a mixture of turpentine and ether, chloroform, alkalies, or alkaline mineral waters. It is very doubtful whether either of these has any such effect, but alkalies and mineral waters often do a great deal of good in these cases. The various consequences which may result from gallstones must be treated as they arise. Inflammation about the gall-bladder, from whatever cause, requires poultices and fomentations. If pus forms, or if in chronic cases much fluid collects, it is sometimes requisite to puncture the cyst and let it out, leaving an external fistula.

CHAPTER LI.

DISEASES OF THE SPLEEN.

CLINICAL CHARACTERS.—1. The spleen is often diseased without giving rise to any local morbid sensations. When it becomes much enlarged, it may cause a sense of fulness and tension, chiefly about the left hypochondrium. Occasionally more or less pain and tenderness are complained of. 2. A most important indication of splenic disease is derived from the constitutional condition. In prolonged cases a state known as “splenic cachexia” is induced. This is characterized by extreme anæmia, the mucous membranes being pale and bloodless, and the face presenting a waxy, or sometimes an earthy, sallow aspect; great debility; wasting, but not usually rapid; sense of prostration and dullness; shortness of breath on any exertion, with hurried breathing, chiefly due to the anæmia; tendency to hæmorrhages, especially in the form of epistaxis, bleeding from the gums, and petechiæ under the skin; œdema of the legs and eyelids, or even general dropsy. 3. Symptoms may arise from pressure of an enlarged spleen on surrounding parts, especially on the diaphragm, dyspnoea being thus increased, and pulmonary congestion and catarrh induced. Vomiting may also be excited by pressure on the stomach.

The chief aid in the diagnosis of morbid conditions of the spleen is derived from *physical examination*. The characters of a *splenic tumor* are as follows: 1. It is extra-pelvic, and occupies mainly the left hypochondrium, being felt to come from

beneath the margin of the thorax. In its growth it tends towards the lower abdomen, as well as downwards and to the right, so that ultimately it extends into other regions and comes to be superficial, while it can generally be separated anteriorly from the mass of the dorsal muscles. Percussion often shows an area of splenic dulness upwards towards the thorax or backwards, but rarely reaches above the fifth rib, and does not extend to the spine. There is also a sense of resistance on percussion: with deficient elasticity of the ribs. 2. The tumor is usually very characteristic, being more or less that of the spleen enlarged. The anterior border can be felt directly obliquely down and towards the right, and thin, often presenting one or more notches or shallow excavations. The anterior edge and lower end are rounded. The outline of the spleen may not actually be visible. 3. As a rule the tumor feels firm and solid; now and then gives a sensation of elasticity, but fluctuation is extremely rare. The surface is almost always smooth, but may be irregular. 4. Another important character of a splenic tumor is its great mobility. Generally it can be readily moved in all directions by manipulation, and it is more influenced by the act of respiration than any other tumor, being often felt below the ribs after a deep inspiration when it was previously imperceptible. Posture also affects it markedly. 5. Occasionally a murmur is heard.

Some of the difficulties in recognizing enlargement of the spleen require to be mentioned. 1. It is often not sufficiently large to come below the margin of the thorax, and can then only be made out by percussion. 2. Even when of some size, it may be kept up by the costo-colic fold of peritoneum, or by adhesions at its upper border. Adhesions may also prevent any mobility and cause the tumor to become fixed. 3. The enlargement is sometimes so great as to obscure altogether the outline of the spleen and the characters of its margin, the latter then assuming a vertical position. 4. Enlargement of other organs is liable to conceal splenic tumor. Accumulation of flatus in the colon may interfere with its detection. 5. The morbid conditions for which enlarged spleen is likely to be mistaken are: cancer about the cardiac end of the stomach; enlarged left lobe of liver; tumor of the omentum; and tumor in connection with the left kidney or suprarenal capsule.

SPECIAL DISEASES OF THE SPLEEN.

I. CONGESTION OR HYPEREMIA.

ETIOLOGY.—The spleen readily becomes congested, on account of its great vascularity and the yielding nature of its capsule. After a meal it is more or less in this condition. Active hyperæmia is commonly observed in acute febrile diseases, especially in typhoid fever, and in intermittent fevers, but also in typhus, erysipelas, præmia, puerperal fever, and acute tuberculosis. It is said to be occasionally vicarious in menstruation. Injury or morbid deposits may cause it. Mechanical congestion follows any obstruction to the portal circulation, direct or secondary to chronic heart and lung-affections.

ANATOMICAL CHARACTERS.—The morbid characters of a recently congested spleen are enlargement, often considerable, the capsule stretched and smooth; increase in weight; intense redness of surface; and diminution in consistence, the substance of the organ in

instances being quite pulpy or almost liquid. The amount of blood is much increased; red blood-cells are extremely abundant; and the splenic tissue appears increased in some cases. After long-continued or repeated hyperæmia the spleen becomes permanently enlarged, hardened, and hypertrophied.

SYMPTOMS.—The only clinical sign of congested spleen usually observed is that the organ is enlarged, but not as a rule to any great degree, and it is liable to vary considerably. Occasionally it feels soft, but is generally tolerably firm. There is no spontaneous pain in most cases, but tenderness is common, and may be very marked in acute congestion. Temporary general anæmia has been stated to be associated with extreme splenic congestion.

II. HÆMORRHAGIC INFARCTION—SPLENITIS.

ETIOLOGY AND PATHOLOGY.—The spleen is one of the organs in which emboli most frequently lodge, giving rise to hæmorrhagic infarctions. Some are of opinion that these may also arise from the formation of local thrombi within the vessels of the organ. Occasionally considerable inflammatory action is excited, especially when the emboli have septic properties, as in typhus or pyæmia, and this is the most frequent cause of splenitis. In rare cases inflammation results from injury; and it has also been stated to arise from malaria, especially in certain tropical climates; or idiopathically.

ANATOMICAL CHARACTERS.—Infarctions in the spleen are usually seen on section of the organ, in the form of wedge-shaped masses, with the base towards the surface, often projecting somewhat; when situated deeper in the organ they are more or less rounded. They vary considerably in number and size. Originally each infarction is dark and firm, and surrounded by congestion; in time, however, the ordinary changes take place, the coloring matter becoming absorbed, until the mass assumes a yellowish-white color. Frequently caseous degeneration with ultimate absorption follows, a depressed cicatrix remaining; or it may end in calcification. In pyæmia and similar affections the infarctions rapidly break down into a purulent fluid, at the same time the spleen being more or less inflamed and congested throughout. Idiopathic inflammation at first cannot be distinguished from mere congestion, the spleen being enlarged, very dark, and softened. One or more abscesses may form, which sometimes finally involve the entire organ, this being converted into a mere bag of pus. An abscess occasionally bursts externally, or into the peritoneum, stomach, or thorax. Rarely it becomes encapsuled and undergoes curative changes, its fluid portion being absorbed, so that finally only a caseous mass remains, which may calcify. The peritoneum is often inflamed over the affected part.

SYMPTOMS.—Very rarely can embolism in the spleen and its consequences be recognized during life, but it may be suspected if, along

with some source of embolism, there should be rigors and pyrexia, with local signs indicating inflammation of the spleen, viz., pain and tenderness in the left hypochondrium, enlargement of the organ, and vomiting in many cases. An abscess is scarcely ever diagnosed; it may possibly give rise to a fluctuating enlargement, or even burst externally. It is attended with hectic fever and rapid wasting. Should it rupture internally, there are the usual signs of perforation.

III. HYPERTROPHY—LEUCOCYTHÆMIA.

ETIOLOGY AND PATHOLOGY.—By far the most important form of enlarged spleen is that which is due to hypertrophy of its tissue. This may follow any long continued or repeated congestion, but is particularly observed after ague, or even after mere residence in malarial districts, and as the result of chronic portal obstruction. Under these circumstances the hypertrophy seems to be chiefly due to interference with the escape of the cells out of the spleen, and not to excessive formation. This morbid condition is most important, however, in connection with the disease named *leucocythæmia* or *leuckæmia*, which is characterized by the presence of a great excess of white corpuscles in the blood, and an increase in the lymphatic tissues in certain organs and structures, especially in the spleen and lymphatic glands, but also occasionally in the liver, kidneys, lungs, heart, thyroid gland, suprarenal capsules, and in connection with serous and mucous membranes. Virchow has described two chief forms of the affection, in one of which the spleen is alone enlarged, this being much the more common; in the other only the lymphatic glands. In some instances both are implicated. The increase in the white blood-cells is no doubt mainly due to excessive formation in the spleen or lymphatic glands, but it has also been attributed partly to diminished metamorphosis of these into red corpuscles, to their proliferation in the blood, and to a new formation by the walls of the vessels. Nothing satisfactory is known about the remote causes of this disease.

ANATOMICAL CHARACTERS.—In hypertrophy from hyperæmia the spleen is increased in size and weight, sometimes to a great degree, but retains its normal form; its consistence is increased, and a section appears pale and dry, sometimes gray, or presents black spots or patches due to pigment. The tissue is quite normal, but increased and condensed, the trabeculæ being also thickened and firm, appearing as white traversing lines.

When the spleen is involved in leucocythæmia it is at first congested, the cellular elements at the same time increasing. Ultimately it may attain enormous dimensions, and weigh many pounds. As a rule it is abnormally firm, but not invariably. The increase of tissue soon commences, chiefly in the Malpighian corpuscles, which become much enlarged, their vessels also increasing in number, and they are seen on

section as firm, whitish, irregular, scattered nodules, the surrounding pulp becoming more or less atrophied as they extend, and often much pigmented. The trabeculæ are also considerably thickened. Usually the capsule of the spleen is thickened and opaque, and adhesions often form with neighboring structures. Hæmorrhagic infarctions or their remains are not uncommonly seen.

When the lymphatic glands are affected they become more or less enlarged, in some cases forming considerable tumors by their aggregation. They resemble in appearance and structure ordinary glands, being soft, and presenting on section a smooth uniform surface, from which a turbid fluid can be expressed. The cortical portion is much thickened, and microscopical examination only reveals that the normal elements of the gland tissues are in excess.

In the other organs and tissues mentioned, especially the liver, the changes associated with leucocythæmia are observed in the form of little whitish spots, consisting of a soft adenoid tissue, composed of small cells and nuclei. The liver may be occupied by considerable masses of this substance, causing it to be enlarged. These deposits are supposed to be mainly derived from infiltration of the tissue with elements conveyed by the blood from the spleen and glands, but probably they are at least in part due to local hyperplasia of the adenoid tissue normally present in the liver.

The changes in the blood are highly important. In the splenic variety of leucocythæmia it is found to contain an enormous number of ordinary white corpuscles; in the lymphatic variety, there are abundant small cells and free nuclei, like those in the glands; and in mixed cases, as the disease approaches more one type or the other, does the relative proportion of these microscopic elements vary. Other characters of the blood are marked lowering of its specific gravity; great diminution of red corpuscles and therefore of iron; increase of water; and in some instances, according to Scherer, the presence of abnormal ingredients, such as are usually found in the spleen, viz., hypoxanthin, lactic, formic, and acetic acids. The proportion of white corpuscles differs in blood taken from different parts of the body, being highest in that of the splenic vein. After death soft yellow clots are often found in the heart and great vessels, sometimes almost purulent-looking.

SYMPTOMS.—Hypertrophy of the spleen may exist for a considerable time, and to a marked degree, without producing any evident disturbance. In many advanced cases, however, there are signs of marked splenic cachexia. Physical examination usually reveals quite distinctly the enlarged spleen.

In *leucocythæmia* the essential clinical phenomena may be summed up as: 1. More or less intense splenic cachexia, which often attains a high grade. 2. In the majority of cases the physical signs of enlarged spleen, in some instances this organ being so hypertrophied as to lead

to general enlargement of the abdomen. 3. In a comparatively few cases enlarged masses of lymphatic glands, either externally, internally, or both; and occasionally signs of enlarged liver. 4. Sometimes evidences of pressure by the spleen on surrounding structures, especially the diaphragm. 5. Peculiar changes in the blood. It is customary to describe the characters of the blood and the clot obtained after a small venesection, but these patients cannot afford to lose blood, and it is quite sufficient to prick the finger so as to get just a drop, and examine this microscopically, when the increase in white corpuscles is immediately perceptible. As a rule no subjective sensations are complained of in the abdomen, except a sense of weight and fulness, but transitory pains may be felt. There are often digestive derangements, and vomiting and diarrhoea may be prominent symptoms. Increased excretion of uric acid has been observed. The course of the disease is very chronic, and usually there is no pyrexia in its earlier stages, but there may be some irregular febrile disturbance, and towards the close the temperature is often raised persistently. Death may take place gradually from asthenia and exhaustion, frequently preceded by delirium, stupor, and coma; or more speedily from hæmorrhage, diarrhoea, and other complications.

IV. RARE MORBID CONDITIONS.

1. **LARDACEOUS DISEASE.**—For the etiology, morbid anatomy, and constitutional symptoms of this condition, reference must be made to the general account already given. All that need be said here is that the deposit is in some cases limited to the Malpighian corpuscles, producing the appearance known as the “sago-spleen,” in which translucent granules are observed, resembling boiled sago. Clinically the enlargement of the spleen is recognized by its very hard and dense consistence; and by its steady growth, the organ finally reaching extreme dimensions in some cases. Other organs are always involved; while there is some constitutional condition present with which albuminoid disease is associated.

2. **CANCER** of the spleen is almost a curiosity. It occurs in the form of nodules or masses of encephaloid, and is always secondary. During life the enlargement is recognized by its irregular and nodular character. Usually pain and tenderness are complained of. Other organs are always implicated.

3. **HYDATID TUMOR** has been in rare instances met with in the spleen, the liver being affected at the same time. It may give rise to a prominent tumor, having the usual semi-globular fluctuating character of a hydatid cyst.

4. **TUBERCLE** is chiefly met with as a part of acute miliary tuberculosis. Now and then it occurs in cases of chronic phthisis. It cannot be recognized clinically.

5. The spleen is often shrunken and atrophied, but this leads to no ill effects.

V. GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

DIAGNOSIS.—Practically it is only by *physical examination* that diseases of the spleen can be positively recognized. The chief difficulties attending this have already been indicated. The general symptoms aid the diagnosis materially in advanced cases. In leucocythæmia of course examination of the blood is highly important. The history also helps in some cases, especially if it reveals exposure to malarial influence, or the previous occurrence of attacks of ague. Should there be portal obstruction, enlargement of the spleen is a necessary consequence.

PROGNOSIS.—Acute affections of the spleen are rarely dangerous in themselves. Chronic affections are usually slow in their progress, except in the case of malignant disease, and if there is mere hypertrophy the health is often not disturbed for a long time. Treatment seems to have very little effect in reducing this hypertrophy if it once arises. Leucocythæmia has been considered an incurable disease, but recent experience indicates that it may be greatly benefited. It lasts a variable time, being usually chronic, but its average duration is said to be from thirteen to fourteen months.

TREATMENT.—No special interference is needed in acute forms of splenic disease, unless an abscess should form and be recognized, which must be treated in the usual way. Quinine has a marked influence in reducing malarial congestion, even after it has existed for some time. When there is mechanical congestion, any impediment in connection with the portal circulation must be removed, if possible, but if not, saline purgatives act beneficially by relieving the vessels. In hypertrophy and leucocythæmia one of the chief objects of treatment is to improve the general health and blood state by the administration of iron, mineral acids, quinine, and similar remedies, as well as by a nutritious diet, change of air, and attention to hygienic measures. Iodides and bromides have been supposed to reduce the size of the spleen, but in my experience they have been of no use whatever. A case of leucocythæmia recently treated by Dr. Wilson Fox was remarkably benefited by phosphorus; and in another case, under my own care, the administration of this drug seemed to have a marked effect in reducing the size of the spleen and enlarged glands, and in diminishing the number of white corpuscles in the blood. Friction over the corresponding region with iodide of mercury ointment has been recommended with the view of reducing the size of the spleen. Extirpation of the organ has been advocated as a last resource. Various symptoms must be treated as they arise.

CHAPTER LII.

DISEASES OF THE PANCREAS.

CLINICAL CHARACTERS.—1. Pancreatic affections are frequently attended with painful sensations, described as lying deep in the abdomen, a little below the epigastrium. The pain often shoots in various directions, and occasionally comes on in violent paroxysms, resembling those of hepatic colic. In some cases there is deep tenderness. 2. Important symptoms are believed to arise from changes in the quantity and quality of the pancreatic secretion. When formed in excess, being at the same time usually of an irritable quality, it is supposed by some to be the cause of a form of pyrosis, attended with the discharge of a viscid, slimy fluid: as well as of diarrhoea, the stools containing a tenacious material, or being sometimes dysenteric. On the other hand, deficiency or absence of pancreatic juice from the alimentary canal, whether arising from changes in the gland-tissue or obstruction in connection with the duct, or abnormal quality of the secretion, has been considered to give rise to a characteristic phenomenon, viz, the passage of a large amount of fatty or oily matter in the stools, which separates from the general mass of the faeces. Frequently there is constipation at the same time, the faeces being dry and hard. Other digestive derangements are common, and may be partly due to the absence of pancreatic juice from the bowels. 3. Pressure upon or irritation of neighboring structures is often a cause of prominent symptoms in pancreatic disease, especially jaundice, vomiting, eructations and other gastric disturbances, and aortic pulsation. The pain is also partly due to this cause in many cases, from pressure on the nerves or vertebrae, the latter being occasionally eroded. 4. *Physical examination* may disclose a morbid condition of the pancreas, but it requires to be performed very thoroughly and often repeatedly, the stomach and colon being empty, before a satisfactory conclusion can be arrived at. The healthy pancreas can now and then be felt on making deep pressure in very thin persons with loose abdominal walls, especially if the spine is somewhat curved forwards; this is more frequently the case when the organ is enlarged and hardened. It is, however, in the detection of a tumor of the head of the pancreas that physical examination is of most value. This is distinguished by the following characters: *a.* It is situated deeply at the back of the abdomen, in the region of the pancreas. *b.* The dimensions are always small, and the shape generally more or less rounded. *c.* The tumor is quite fixed. *d.* It feels dense and hard. It must be mentioned that marked pulsation and bruit may result from pressure of the pancreas upon the aorta. 5. Pancreatic disease is often attended with extreme emaciation, anaemia, and debility, due to the interference with nutrition and other causes.

SPECIAL DISEASES OF THE PANCREAS.

These will need but a very brief consideration, and some of them only require enumeration.

1. **PANCREATITIS.**—Acute inflammation of the pancreas is very rare. It is said to be characterized anatomically by hyperaemia; swelling; in-

duration or softening; with exudation into the cellular tissue and upon the surface, occasionally ending in purulent infiltration or formation of abscesses. The last event is said to be not uncommon as the result of metastasis from the salivary glands and testis. Very rarely the inflammation ends in gangrene. The symptoms are described as dull deep-seated pain in the region of the pancreas; nausea and vomiting of a viscid liquid; thirst; constipation; and some pyrexia. Rupture of an abscess may give rise to serious symptoms.

2. The following morbid conditions may be mentioned together, viz.:

- (i.) So-called *hypertrophy*, which generally involves the entire gland, and is the result of chronic inflammation or long-continued mechanical congestion from portal obstruction, the pancreas being enlarged and hardened.
- (ii.) *Atrophy*, usually associated with senile changes; some cachexia; local disease of vessels; or pressure by surrounding disease.
- (iii.) *Induration* or *softening*, with or without hypertrophy or atrophy.
- (iv.) *Fatty infiltration* and *degeneration*. If these give rise to any symptoms at all, they are those due to deficiency or abnormal quality of pancreatic secretion. A hypertrophied organ may be felt in some cases; and occasionally it gives rise to pressure symptoms.

3. Not uncommonly *calculi* form in the pancreatic duct, which may be in large number and of some size. They interfere with the escape of the secretion. I am not aware that their passage causes any symptoms. The ducts are sometimes dilated into cysts.

4. The chief disease of the pancreas is *scirrhus of the head*. There is a difference of opinion as to the nature of this morbid condition, some pathologists regarding it as the result of cancerous deposit; others considering that it is merely due to fibroid changes resulting from chronic inflammation, and the latter affirm that the pancreas is peculiarly free from cancer, escaping often even when it exists all round. I have had the opportunity of observing five cases of this disease, and of making a post-mortem examination in four of them, and certainly in these the affected portion of the pancreas presented well-marked general and microscopic characters indicative of scirrhus cancer. The mass varies in size, but does not attain large dimensions; it has an extremely hard and dense consistence, and a whitish section. It frequently becomes adherent to and involves the duodenum, which may be ulcerated and greatly narrowed. It may also form adhesions with other structures, to which the disease may then extend. The pancreatic and common bile-ducts as a rule become obstructed. The latter is usually supposed to be closed owing to pressure upon it by the enlarged pancreas, but this is probably more frequently due to contraction about the orifice or in the course of the duct, from changes in its own tissues, jaundice and its accompaniments necessarily resulting. The body of the pancreas is usually enlarged; sometimes it is atrophied. Now and then serious disorganization of neighboring parts is

produced, leading to erosion of the vertebræ, perforation of the diaphragm, or the opening of a large vessel.

But little is known about the causes of this disease. Generally it occurs in elderly persons, but one of the most marked cases I have met with was in a young man aged 23. In only one instance was there any history of intemperance.

SYMPTOMS.—The clinical history of scirrhus of the pancreas is decidedly indefinite and uncertain. In general terms the clinical phenomena may be stated as deep pain in the region of the pancreas, aching, gnawing, or lancinating in character, or sometimes attended with a sense of burning or tightness, in some cases greatly increased paroxysmally, and also frequently rendered worse by food, coughing, deep breathing, movement, or lying on the back; deep tenderness; nausea and vomiting, in some cases severe; various digestive disturbances, the tongue, however, being often quite clean; jaundice, frequently intense; the passage of much fat in the stools, the bowels being usually constipated; the detection of a tumor having the characters already described; with great wasting, anæmia, and debility. As showing the irregular character of cases of this disease it may be mentioned that there may be no pain or tenderness from first to last: that symptoms due to biliary obstruction may be the only prominent phenomena throughout; that it may be impossible to detect any tumor; and certainly that excess of fat in the stools is by no means always observed.

Among exceedingly rare morbid deposits in the pancreas are mentioned *encephaloid cancer*, *colloid*, *melanosis*, and *tubercle*.

DIAGNOSIS.—It is only disease of the head of the pancreas that can be at all diagnosed with any approach to certainty, and in many cases it is very difficult to do this, at all events for some time. The chief diseases for which it may be mistaken are affections of the stomach, especially about the pylorus, duodenum, and liver. The paroxysms of pain may closely resemble those associated with the passage of a gall-stone. Occasionally by pressing on the abdominal aorta, this disease gives rise to pulsation and bruit, simulating an aneurism. Whenever any of the symptoms described are complained of, especially jaundice coming on without any obvious cause, pancreatic disease should be always borne in mind. I believe it not uncommonly escapes recognition, simply because it is never thought of. An important means of diagnosis is to exclude as far as possible affections of the neighboring structures. It must be remembered that the liver is liable to be enlarged as the result of the obstruction of the ducts associated with pancreatic disease. Physical examination is most important in diagnosis, and in doubtful cases it should be thoroughly carried out again and again, by which a satisfactory conclusion might in many instances be arrived at in course of time.

PROGNOSIS is necessarily serious in cancer of the pancreas, the disease being fatal, and seldom of long duration.

TREATMENT must be entirely symptomatic, directed especially against pain, vomiting, jaundice, loss of flesh and strength, anæmia, and debility.

CHAPTER LIII.

DISEASE OF THE SUPRARENAL CAPSULES—ADDISON'S DISEASE.

ETIOLOGY AND PATHOLOGY.—Dr. Addison first drew attention to a series of symptoms which he believed were associated with disease of the suprarenal bodies, one of the most prominent being a peculiar discoloration or bronzing of the skin. Since his time the subject has been investigated by many observers, but there are several points bearing upon the pathology of this complaint which are still very doubtful. In the Croonian lectures for 1875, Dr. Greenhow discussed the various questions at length, and for full information the reader is referred to these lectures or to his more recent work.

The first question is whether any relation exists between the phenomena of so-called Addison's disease and a morbid condition of the suprarenal capsules. Greenhow maintains that there is such a relationship, but others deny this. With regard to the bronzing of the skin, which, however, is by no means the most important or an essential symptom of Addison's disease, this has been described in cases where there was no suprarenal mischief, but Greenhow affirms that the discoloration was different from true bronzing. On the other hand suprarenal disease has been frequently noticed where there was no bronzing, which may be accounted for in some instances by the fact that this symptom appears at a comparatively late period, and that the progress of the complaint may be so rapid as to terminate in death before it could be developed. But, further, this leads to the question of the nature of the lesion of the suprarenal capsules in Addison's disease. Some suppose that its phenomena may be due to any morbid condition of these organs; but Greenhow holds that they are only observed in connection with a special lesion, which will be presently described. As to the mode in which disease of the suprarenal capsules produces these effects, there is strong evidence to prove that it is not through any destruction of their tissues and mere abolition of their functions, whatever these may be. These organs have a large supply of nerves, which are intimately connected with the trunk of the sympathetic in the abdomen, as well as with the phrenic and pneumogastric nerves,

and through these with the cerebro-spinal centres. The morbid changes also tend to involve the nerves in their vicinity, and may even extend so as to implicate the semilunar ganglia and solar plexus. It seems highly probable that the phenomena of Addison's disease are attributable to this implication of such important nerves, which are first irritated, and subsequently become atrophied and destroyed. The nerve lesions have been considered by some observers as arising primarily, and as being altogether independent of suprarenal mischief.

With respect to the *exciting cause* of the special suprarenal lesion, Greenhow states that it is frequently due to the extension of inflammation from diseased or injured adjacent parts. It has also been referred in some instances to a severe strain, blow, or physical shock; usually in the back; over-exertion; nervous shock, grief, or anxiety; and intermittent fever.

There are some important *predisposing causes* of Addison's disease. It is much more frequent among males; is found almost exclusively in those employed in active manual labor, and especially in connection with those occupations which expose to bodily injury from accident or over-exertion; and is almost confined to the laborious periods of life. There may be a predisposing constitutional condition in some instances.

ANATOMICAL CHARACTERS.—The suprarenal bodies may be the seat of the following morbid changes: 1. Acute inflammation ending in suppuration. 2. Tubercle. 3. Cancer, always secondary and usually of the encephaloid variety. 4. Amyloid disease. 5. Fibroid degeneration with hardening. 6. Fatty degeneration. 7. Atrophy. 8. Hemorrhage. 9. Peculiar alterations associated with Addison's disease. Only the last need be described, and the changes observed are supposed to be the result of a chronic inflammatory process, the organs becoming infiltrated with an exudation of a low type which is converted into a firm fibrous material, and this undergoes degenerative changes along with the tissues of the suprarenal capsules, which it invades upon and destroys. The affected organs are usually enlarged, firm, and nodulated; though in rare cases they are normal or small in size. In the early stage of disease they are occupied by a softish, semi-translucent, grayish or greenish-gray, apparently homogeneous substance, which on exposure to the air assumes a pinkish hue. This becomes firmer, and undergoes caseous degeneration, giving rise to yellowish, opaque, cheesy nodules; or not uncommonly forming a creamy or purulent looking fluid, varying in thickness, and occupying either one large cavity in the centre of the capsule, or, more frequently, several small cavities. Sometimes calcification follows, cretaceous granules or small masses being formed, or a putty-like material, or finally a dry chalky mass. The gray material and the products of degeneration are always found associated together, though in very variable proportions,

and gradations may be seen from the one to the other. Under the microscope the former is seen to consist of a fibrillated stroma containing numerous lymphoid corpuscles, while the caseous masses are made up of altered cells, nuclei, granular matter, and oil. In many cases there is great thickening of the covering of the capsules, with extensive proliferation of the surrounding cellular tissue, and the formation of firm adhesions to adjacent organs; the nerves become thus invested in a dense indurated tissue, and their fibrous investment has also been found hypertrophied.

Other morbid appearances have been described in different cases of Addison's disease, viz., enlargement of the neighboring absorbent glands, which are either normal in structure, or firm, glistening, pale, and in process of caseation; enlargement of the solitary glands of the small intestines, and sometimes of the large; mammillations, small ecchymoses, superficial erosions or small ulcers in the stomach; atrophy of the mucous coat of the alimentary canal, with degeneration of the glands; and enlargement of the spleen, which may be considerable, the organ being usually dark-colored and soft. Dr. Greenhow states that the composition of the blood does not undergo any important alteration in uncomplicated cases of this complaint.

SYMPTOMS.—One of the most prominent clinical phenomena of Addison's disease consists in a peculiar cachexia, which sets in gradually and indefinitely without any obvious cause, characterized by increasing muscular debility, languor, and indisposition for any bodily or mental effort, at last amounting to extreme prostration; an aspect of listlessness and depression; marked anæmia, the sclerotics being pearly-white; wasting, but not to any degree, nor is it always observed, while there is often a peculiar tendency to the formation of fat, the subcutaneous fat being in some cases very abundant; remarkable feebleness of the heart's action, the pulse becoming very soft, usually weak, and compressible, there being also a tendency to giddiness and faintness, sometimes amounting to prolonged attacks of syncope, and to palpitation on exertion, with breathlessness. Another characteristic feature is a gradual discoloration of the skin, which assumes the so-called *bronzed* appearance. This appears at very variable periods in different cases, and is due mainly to the presence of yellowish-brown pigment-granules in the *rete mucosum*, or occasionally of pigment-cells. Traces of pigment may be found in the superficial layers of the epidermis, with pigment-granules here and there in the cutis. The exact hue varies, and it becomes darker by degrees. It often resembles that of a mulatto, but may be simply dingy or smoky, brown, yellowish-brown, greenish-brown, grayish-black, or almost black. It extends all over the body, but is never uniform throughout, usually commencing and being most marked over exposed parts, as the face and neck, on the upper extremities, in the axillæ, and about the penis, scrotum, and navel. It shades

off gradually, but where the skin has been injured or irritated, this part becomes much darker and presents defined margins. The palms and soles sometimes exhibit spots of pigment. The mucous membranes are also discolored, the lips in some instances assuming a mulberry hue, or irregular and ill-defined spots and patches of pigment being observed upon them and on the inside of the cheeks and gums, with dark streaks opposite the angles of the mouth. A peculiar pigment has also been described in the structures of the eye, as seen with the ophthalmoscope, but the conjunctivæ always remain normal. In addition to these symptoms there is usually more or less pain in the epigastrium, in some cases extremely severe; and irritability of the stomach, with nausea, retching, or vomiting, which may be urgent and irrepressible. Other digestive disorders are also common, appetite being lost, and obstinate diarrhœa sometimes sets in, though constipation is the rule. The tongue is usually red and moist. Pain in the loins is often complained of. Frequently one or both hypochondria feel tender, and Dr. Greenhow has noticed sometimes a rigidity of the abdominal muscles, as if they were instinctively contracted to protect deep-seated parts from pressure. The course of the disease is slow and chronic as a rule, but is often subject to remarkable remissions, with improvement in the symptoms, and subsequent exacerbations. In exceptional instances the progress is acute and rapid, or the disease may be latent for a long time and then run a very rapid course. Death generally results from gradual asthenia, there being towards the close frequent sighing or yawning, with persistent hiccough. The mind is in many cases clear to the last, but the patient may be drowsy or semi-comatose, or grave nervous phenomena may arise. The temperature is usually low throughout, but towards the close it falls considerably, the skin being cool or cold. The urine is often diminished, of low specific gravity, and deficient in solids.

DIAGNOSIS.—It is only necessary to mention that should symptoms of failing health and cachexia appear, without any evident organic mischief to account for this, Addison's disease ought to be remembered. When the bronzing appears, there should be no doubt respecting the nature of the complaint.

PROGNOSIS is very grave, the disease always ending fatally, but the duration may be very prolonged.

TREATMENT.—All that can be done is to promote health and strength by means of a highly nutritious diet; tonics, especially quinine, tincture of steel or syrup of the phosphate of iron, and strychnia; general hygienic measures; and by maintaining the alimentary canal in order. Rest and the avoidance of all bodily and mental excitement are important. Symptoms must be attended to as they arise.

CHAPTER LIV.

ABDOMINAL ANEURISM.

THE most important form of abdominal aneurism which comes under the notice of the physician is that connected with the aorta, but one may be found on the celiac axis or either of its branches, especially the hepatic; on the mesenteric or renal arteries; or on one of the iliac vessels. For the pathology and anatomical characters, reference must be made to the chapter on thoracic aneurism.

SYMPTOMS AND SIGNS.—In many cases the only clinical indications of abdominal aneurism consist in the detection of a tumor, having the usual physical characters of an aneurism. Often, however, there are signs of pressure on surrounding structures; local morbid sensations; and evidences of serious constitutional disturbance; and these may be alone present, without any physical signs of an aneurism, or only such as are very obscure. The *physical characters* of an abdominal aneurismal tumor are as follows: 1. It is usually seated in some part of the course of the aorta, but frequently projects more to one side than the other, especially towards the left. Of course it may occupy other regions, corresponding to any vessel affected. 2. As a rule the shape is more or less rounded; the surface smooth; and the tumor yields somewhat on being compressed. 3. Almost always it is quite fixed and immovable, being unaffected by respiratory movements, though if it is very large it may interfere with these movements. 4. One of the most important characters is the presence of more or less pulsation, synchronous with the cardiac systole usually, but sometimes also diastolic; distinctly expansile; tending laterally as well as forwards, and not uncommonly more to one side; occasionally attended with a thrill. 5. Percussion reveals dulness corresponding to the extent of the tumor; with a sense of much resistance. 6. In many cases there is a systolic murmur, which is sometimes very loud and harsh, but it is by no means always heard, or may be very slight or more like an arterial sound, and occasionally it is seated beyond the aneurism. There is never any diastolic murmur. The murmur is often influenced considerably by posture and pressure.

There are a few points of practical importance which demand notice. 1. The signs may be most evident in the back, and it is always essential to make careful examination here, should aneurism be suspected. Sometimes there is no obvious sign except a murmur in this region. 2. There is no relation between the size of an aneurism and the degree of pul-

sation or murmur. 3. Occasionally the tumor is movable; and not uncommonly both pulsation and murmur are considerably influenced by posture, it being hence necessary to examine in different positions. It is important, however, to observe, that the impulse does not tend to disappear when the patient is placed in a kneeling attitude supported by the hands. 4. The physical signs may change considerably during the progress of any particular case.

The pressure-symptoms will vary with the situation of the tumor. Among the most common are neuralgic pains, sometimes extremely severe, and shooting in different directions, owing to pressure on nerves, this occasionally also causing permanent contraction of the flexors of the hip-joint; deep gnawing pain, from erosion of the vertebræ; anasarca of one or both legs, with distension of the superficial veins, due to pressure on the vena cava or one of the iliacs. In some cases micturition is affected at times; and albuminuria may set in from pressure on the renal veins. Wasting of the testis has been noticed as the result of obliteration of the spermatic artery. Aneurism of the hepatic artery must be borne in mind as a possible cause of jaundice and ascites, by pressing on the neighboring duct and portal vein.

In some instances a subjective feeling of uncomfortable pulsation is experienced. The alimentary canal is often out of order, and I have known obstinate constipation to be the prominent symptom complained of in a case of aneurism of the abdominal aorta. Patients frequently look well, and their general condition is satisfactory; but sometimes they present a very peculiar aspect, indicating profound illness with anæmia, even when there are no distinct physical signs of aneurism.

DIAGNOSIS.—The chief conditions which may simulate abdominal aneurism are: 1. Simple aortic pulsation. 2. The pancreas or a solid tumor transmitting an impulse from the aorta; or giving rise to a murmur by pressure. 3. A fluid accumulation, such as hepatic abscess or hydatid tumor, receiving an impulse from the aorta. The diagnosis must be founded on a careful consideration of all the features of the case, as regards history, symptoms, and physical signs; but it is important to notice that in all the conditions just mentioned the pulsation is but rarely expansile, and both it and any murmur generally disappear if the patient is placed in a kneeling attitude supported on the hands. The diagnosis from mere aortic pulsation requires a few words of special comment. The chief facts in favor of this condition are as follows: 1. It is generally seated in the epigastrium. 2. It is observed most commonly in highly nervous and anæmic persons, especially women; in very thin individuals; or in those who suffer much from chronic dyspepsia. 3. There are no signs of pressure; nor is there any pain or tenderness as a rule. 4. The impulse is scarcely ever expansile and lateral, but merely tends in a forward direction, and is never attended with a thrill; there is no increase in dulness, or any evident

tumor; and if a murmur is present, it is soft and blowing or whiffing, never harsh or loud. Some cases are difficult to diagnose with certainty, and then the progress of the case must be watched, and the effects of treatment observed.

It must not be forgotten that an aneurism may exist without giving rise to any physical signs. Occasionally, also, it presents the characters of a solid tumor without any pulsation or bruit. If obscure abdominal symptoms are complained of, particularly deep pain near the spine, and especially if there are indications that the constitution is gravely disturbed, aneurism should be thought of, and careful examination made repeatedly, over the back as well as in front.

TREATMENT.—In addition to what has been previously stated regarding the treatment of aneurism, it is necessary to allude to a special method introduced for the cure of aneurism of the abdominal aorta, viz., the rapid-pressure treatment, first employed by Dr. W. Murray, of Newcastle-on-Tyne. The plan is to keep the patient well under chloroform, and apply a tourniquet over the aorta above the tumor, maintaining steady and constant pressure until all pulsation has ceased in the aneurism on removing the tourniquet. The blood coagulates in the sac, and afterwards collateral circulation is set up. The results of this treatment have certainly been such as to recommend its adoption in appropriate cases, if other measures do not appear to be followed by good effects. If the aneurism is high up, distal pressure may possibly be of service. Pain is a symptom often calling for interference, and is best relieved by subcutaneous injection of morphia. Posture may influence it considerably. It is highly important to attend to the state of the digestive organs. A belladonna plaster should be worn constantly over the aneurism.

CHAPTER LV.

DISEASES OF THE URINARY ORGANS.

CLINICAL CHARACTERS.—1. The morbid sensations connected with the urinary organs may be referred to the lumbar regions, to the course of the ureters, to the hypogastrium, or to some part of the urethra. The chief include different kinds of pain, tenderness, uneasiness, fulness or tension, heat or burning along the urethra, itching or tickling at the end of the penis. With respect to pain, it is important to ascertain whether it is increased by movement of the body, especially by sudden jolts, as after walking, jumping, riding, or driving; if it is affected by the act of micturition, being either relieved or intensified, or even only complained of during or after this act; and if it is influenced by any articles of diet or drink. Not uncommonly a sympathetic pain is felt along the spermatic cord to the testis, and this organ may be retracted.

2. The act of micturition is frequently disturbed. The principal deviations are a too frequent or almost constant desire to pass water, sometimes coming on suddenly, so that the patient cannot retain the urine for an instant, or on the other hand being combined with more or less dysuria or strangury; simple dysuria, even to complete retention; and incontinence, the urine coming away involuntarily, either constantly or only at times, especially at night during sleep. The stream of urine may present abnormal characters. The amount passed may also vary greatly from health, being either diminished more or less to actual suppression, or increased.

3. Important symptoms associated with certain renal affections result from the abnormal state of the blood which they induce, especially dropsy, and the phenomena grouped under the term *uræmia*. The latter will be presently treated of in detail.

4. When the kidney is enlarged, it occasionally gives rise to symptoms by pressing upon adjoining structures.

5. Rupture of the kidney or bladder will occasion serious consequences, especially when attended with extravasation of urine.

6. *Physical examination* connected with the urinary organs includes: *A. Examination of the urine.* *B. Investigation for renal tumor.* *C. Examination directed to the bladder and urethra, externally; by the use of the catheter, sound, and endoscope; and through the rectum and vagina.* For an account of the special examination of the bladder and urethra reference must be made to surgical works, but it will be desirable to point out the physical signs of a distended bladder. It should also be mentioned that in cases of renal disease it is of considerable importance to examine the heart and vessels, and to make use of the ophthalmoscope.

A. EXAMINATION OF THE URINE.

Examination of the urine is a matter of the deepest importance, and is even at the present day but too much neglected in ordinary practice. It gives valuable information in other affections besides those of the urinary organs, and in the succeeding remarks it is proposed to give a concise outline of the mode in which the clinical investigation of this fluid is to be conducted, which has been mainly gathered from Dr. W. Roberts's most valuable work. It need scarcely be remarked that a previous knowledge of the characters of the urine in health is requisite, as well as of its composition, with the average proportion of its chief constituents, and the main physiological variations to which they are liable; the changes which the urine undergoes on standing must also be remembered.

(i.) *GENERAL EXAMINATION.*—The first thing to be done with any specimen of urine is to observe its physical characters, including color and general aspect; clearness or turbidity, consistence, characters of the froth on shaking, odor, reaction, specific gravity, and presence or absence of any deposit. It is often of much importance to measure the quantity passed in the twenty-four hours, and when taking the specific gravity or making quantitative analyses a specimen from a mixture of the whole of this should be employed. The reaction ought to be taken as soon as possible after the urine has been passed, by means of turmeric, and blue, green, or violet-tinted litmus-papers. Should it be alkaline, it is requisite to determine whether this is due to fixed alkali or ammonia, which is proved by drying the test-paper in the open air, when, if the alkalinity depends on ammonia, this evaporates and the paper is restored to its former color. Further, it is very important, should the urine be ammoniacal, to ascertain whether it is discharged in this condition, or if it arises subsequently from decomposition, and how soon. The specific gravity is ascertained by the urinometer, care being taken that this does

not touch the sides or bottom of the glass containing the urine; and that the number on the stem which represents the density is read off by looking at it on a level with the surface of the liquid.

(ii.) **CHEMICAL EXAMINATION.**—This is carried out with the view of determining: *a.* The presence and proportion of certain normal constituents of urine, especially urea, uric acid, hippuric acid, chlorides, phosphates, and sulphates. *b.* The presence and quantity of abnormal organic ingredients, chiefly bile, albumen, sugar, pus, and fat. *c.* The nature of any deposit. *d.* The existence of various substances introduced into the body from without, such as lead or arsenic. It is desirable to point out the tests employed for the most important of these materials.

Urea.—The qualitative test for urea is to add pure nitric acid to some urine carefully concentrated by evaporation in a water-bath, when a crystalline precipitate of nitrate of urea is thrown down, the crystals of which appear under the microscope as flat rhombic or hexagonal plates. **Quantitative Estimation.**—An approximate knowledge of the amount of urea excreted daily, sufficient for ordinary clinical purposes, is obtained by collecting the whole of the urine passed in the 24 hours, and taking the specific gravity of a mixed specimen, provided it does not contain sugar or albumen. A table has been drawn up by Professor Haughton showing the relations between the quantity of urine, its specific gravity, and the amount of urea. For accurate determination the *volumetric method* of Liebig is that generally employed. It depends upon the fact that urea forms with mercuric nitrate a precipitate of definite composition. For this process three solutions are required, viz., 1. One consisting of a volume of a cold saturated solution of barytic nitrate with two volumes of saturated baryta-water. 2. A standard solution of mercuric nitrate. 3. A solution of carbonate of soda, about gr. xx to 3i. A measured quantity of the urine is first mixed with half its bulk of the baryta solution, in order to precipitate the sulphates and phosphates, which are then separated by filtration, a drop or two of the filtrate being further tested to see that these are entirely removed, and if they are not more baryta solution must be added. A certain quantity of the filtrate is then taken, and the mercurial solution very cautiously dropped into it from a graduated burette until it begins to become turbid, the amount required to produce this effect being noted down. No precipitate falls until all the chloride of sodium present has been decomposed, and the quantity required for this must be subtracted in the subsequent calculations from the total volume added. As soon as a precipitate forms, the mercurial solution is to be allowed to flow in freely at first, and afterwards again gradually, the mixture being stirred with a glass rod. In order to ascertain when the whole of the urea has been precipitated, a little of the carbonate of soda solution is placed on a white porcelain surface, and a drop of the precipitated mixture added to it by the aid of a glass rod; as soon as a yellow tinge is thus produced, it indicates that the whole of the urea has been thrown down. The matter then becomes merely one of calculation, the mercurial solution being of such a strength that each cubic centimetre used after the decomposition of the chlorides corresponds to 0.01 gramme of urea.

Uric Acid.—The test for the presence of uric acid is to place a little of the substance supposed to contain it on a porcelain dish, add a little nitric acid, evaporate over a spirit-lamp until a yellowish-red residue is left, and finally touch this when cold with a glass rod dipped in solution of caustic ammonia. A characteristic bright violet color is immediately brought out, due to the production of murexide. To obtain the acid from urine, it is requisite to add excess of strong hydrochloric or acetic acid to a specimen, and let it stand for 24 hours. The uric acid is then precipitated in a crystalline form, and may be tested as above. This is also the method usually followed for its *quantitative estimation*, though it is not very accu-

rate, a measured quantity of urine being taken, and the precipitate collected on a weighed filter, which is afterwards dried and weighed.

With regard to the inorganic acids, it can only be stated that phosphoric is best recognized by the ammonio-magnesian test; hydrochloric by argentic nitrate; and sulphuric by barytic nitrate. The *quantitative estimation* of these substances presents so many practical difficulties, and their proportion is liable to so many variations from different causes, that its consideration would be quite beyond the province of this work.

Albumen.—The two most reliable tests for albumen are *heat* and *nitric acid*, by which it is coagulated and precipitated.

a. The heat-test is best performed by placing some urine in a test-tube, and heating its upper portion by means of the spirit-lamp, this being then compared with the lower part, and thus the slightest opalescence can be detected. There are some important precautions to be observed. 1. It is essential to see that the urine is acid, and should it be alkaline a few drops of acetic acid must be added. 2. The portion of urine employed should be quite transparent and clear, and if there is any permanent turbidity it ought to be filtered; but when this is due to urates, all that is necessary is to pass the tube two or three times along the flame, by which these are immediately dissolved, and then the upper part may be further heated. 3. The portion that is being tested must be boiled, as when the proportion of albumen is small it is only then that cloudiness is observed. The rapidity of coagulation is in proportion to the quantity of albumen present. 4. After heating it is well to add a drop or two of nitric acid, as, if the urine is only faintly acid, earthy phosphates may be precipitated and thus give rise to turbidity. These, however, are immediately dissolved by the acid.

b. The addition of nitric acid to cold urine is, with certain precautions, a very delicate test for albumen. The plan is to place some urine in a test-tube, incline the latter, and gradually pour strong acid down along its side, so that from its higher specific gravity it may sink to the bottom without mixing. It has also been recommended to put some acid in a tube, and pour the urine upon this. At the junction of the two liquids more or less turbidity is observed, which spreads upwards through the stratum of urine. The chief fallacies with regard to the nitric-acid test are as follows: 1. If only a little is added to the urine, the albumen may not be precipitated; and, on the other hand, if a considerable quantity is suddenly mixed with it, the same result may follow, even though there is much albumen present. 2. Cloudiness may not be observed for two or three minutes if the proportion of albumen is very small, and therefore the contiguous strata must be watched for this period. 3. If the urine is highly concentrated, the addition of nitric acid is liable to cause precipitation of urates; in this case, however, the cloudiness begins at the surface of the urine and spreads downwards, while heat dissolves the precipitate instantly. 4. When there is great excess of urea, the acid may cause its precipitation, but this occurs very slowly, and the deposit is crystalline. 5. Opalescence of the urine may be due to cubebs or copaliba, and this is sometimes increased by adding nitric acid. They are recognized by their color, and by the effects of heat, which diminishes the opalescence and prevents any turbidity with nitric acid.

Quantitative Examination.—For ordinary clinical purposes a sufficiently exact estimation of the amount of albumen present in a specimen of urine may be obtained by adding a little acetic acid to some of it in a test-tube, boiling, and then setting the specimen aside until the coagulated particles have all subsided, when the depth of the deposit can be compared with that of the urine, the proportion being expressed as "almost solid," $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ th, or as mere "cloudiness" or "a trace." Sometimes the precipitate from a measured quantity of the urine is col-

lected on a weighed filter, which is washed, dried, and again weighed. Other methods have been employed, but they need not be described. Before estimating the amount of urea and other urinary ingredients, it is requisite to remove any albumen present by carefully acidulating with acetic acid, heating *just to the boiling-point*, and filtering.

Sugar.—Grape-sugar is the variety met with in urine. It has been stated by many observers to be present in healthy urine, but if so, it is only in such minute proportion as to be practically of no consequence in a clinical point of view.

Qualitative Tests.—1. *Reduction-test.* This is by far the most reliable and it depends upon the power which grape-sugar possesses of reducing certain metallic oxides to a lower degree of oxidation or to the metallic state. A salt of copper is usually employed, cupric oxide being reduced to cuprous, which falls as a precipitate. There are two chief modifications of the test, viz., Trommer's and Fehling's. *a. Trommer's.* A drop or two of a weak solution of cupric sulphate is added to some of the urine in a test-tube, and then about half its bulk of liquor potassæ, care being taken that sufficient is added to dissolve all the copper salt. On boiling this mixture, which should be quite clear and free from any precipitate, and of a bluish or bluish-green color, an orange-red precipitate of cuprous oxide falls, which subsequently changes to reddish-brown. This method is for several reasons unsatisfactory, and Fehling's is much more reliable. *b. Fehling's.* Here a standard solution is made use of, composed of cupric sulphate (40 grammes); potassic tartrate (160 grammes); liquor sodæ, of sp. gr. 1.12 (750 grammes); with distilled water to 1154.5 cubic centimetres. This solution is very prone to decompose, racemic acid being produced from the tartaric, which also reduces cupric oxide, and therefore it should be always kept in completely-filled and thoroughly-stoppered bottles, in a cool place, away from the light. The proper mode of using this test-solution is as follows: A drachm or two of it is placed in a tube and heated over the spirit-lamp until it boils; if any decomposition has taken place, a precipitate of cuprous oxide will be thrown down in a minute or two, and should this happen the test-solution is unsatisfactory, and it is best to prepare a fresh specimen. When the solution is satisfactory, if the urine is supposed to contain a considerable amount of sugar, a drop or two of it is to be added while the solution is boiling, when a brick-red precipitate of cuprous oxide falls immediately, and if more urine is added the deposit becomes yellow. Care must be taken under these circumstances not to add too much urine, as great excess of sugar will cause the precipitate to be redissolved, producing a clear yellow solution. If there is only a small proportion of sugar present, the urine must be poured in until nearly as much as the quantity of test-solution employed has been added, but on no account must the quantity exceed an equal bulk. The mixture is again to be boiled, when, if a small quantity of sugar is present, it assumes an intense opaque yellowish-green appearance, and slowly a bright-yellow deposit subsides. If there is no immediate precipitation, the mixture must be set aside in a warm place to cool gradually, when if only a very minute proportion of sugar is present, it by degrees loses its transparency and assumes a light-greenish opacity or milkiness, which is quite characteristic (W. Roberts). It is highly important to avoid boiling for any length of time, as this is quite unnecessary, while uric acid and other urinary ingredients have the power of reducing cupric oxide after prolonged boiling.

2. *Moore's Test.*—This consists in mixing equal quantities of the suspected urine and liquor potassæ in a test-tube, and boiling the upper portion. A change of color is observed to a more or less deep brown, or if there is much sugar present, it may become almost black. This is by no means a reliable test, for it cannot detect small quantities of sugar; while urine which is concentrated and high-colored, or which contains excess of phosphates or much albumen, will become darkened on boiling

with liquor potassæ, and this is particularly the case with markedly albuminous urine if the liquor potassæ has become impregnated with lead from having been kept in glass bottles.

3. *Fermentation Test*.—A small quantity of German yeast is placed in a test-tube, which is then quite filled with the urine, inverted over a shallow dish or saucer containing some of the same, and set aside in a warm place for some hours. If sugar is present fermentation goes on, carbonic anhydride is set free and collects at the top of the tube, gradually expelling the urine. The gas may be tested by a lighted taper. This is not a delicate test. Dr. W. Roberts makes use of the loss of specific gravity in the urine after having undergone this process, both for indicating the presence of sugar and its amount.

4. *Hassall's Test*.—Dr. Hassall considers the growth of the yeast-plant (*torula cerevisiæ*) in urine, visible on microscopic examination, as certain evidence of the presence of sugar. There are several reasons why this test is not very practicable.

Quantitative Estimation.—For diabetic urine, where a large quantity of sugar is passed daily, the specific gravity will give an approximate idea of the proportion discharged. For accurate analysis, however, the following are the chief methods adopted: 1. *Volumetric analysis*.—10 c.c. of Fehling's solution are placed in a flask and boiled, and some of the urine, either alone or diluted with a certain proportion of water, according to the amount of sugar present, is added by degrees from a graduated burette, until the blue color has entirely disappeared, which can be observed by holding the flask between the eye and the light after each addition, allowing it to stand for a minute so that the sediment may subside. The above amount is decomposed by one grain of sugar, and from this the whole quantity of sugar excreted may be determined. 2. *Differential-density method*.—The loss of density in the urine after fermentation is considered by Dr. W. Roberts as giving very accurate information as to the quantity of sugar present. Each degree of density lost corresponds to one grain of sugar in every fluid ounce of urine. 3. The *polariscope* is sometimes employed to estimate the quantity of sugar, provided the urine is transparent, this being determined by the degree to which the plane of polarization is rotated to the right.

In both qualitative and quantitative testing for sugar in urine, it has been recommended first to filter this fluid through animal charcoal.

(iii.) *MICROSCOPICAL EXAMINATION*.—The objects which may be discovered in urine by the aid of the microscope are: *a*. Extraneous materials, such as fragments of cotton, wool or flax, hairs, woody fibres, starch-granules, oil-globules. *b*. Unorganized particles, crystalline or amorphous, including chiefly uric acid and urates, oxalates of lime, phosphates, cystin, xanthin, leucin, and tyrosin. *c*. Organized bodies, viz., renal or other epithelium, renal casts, blood-corpuscles, pus-cells, cancer-cells, fragments of hydatids, pigment, fat, spermatozoa, or low vital organisms, viz., vibriones, mould fungus, torule, and sarcinæ. In order to examine deposits microscopically, a quantity of the urine must be set aside in a conical or cylindrical glass, the supernatant fluid being poured off after standing, and a drop of the sediment then placed on a glass slide. Not uncommonly the microscope is employed also to examine deposits formed during chemical reactions; and, on the other hand, the effects of chemical reagents on objects observed under the microscope sometimes give valuable information.

URINARY DEPOSITS.—It will be well now to consider deposits in urine separately, and to describe the chief characters by which those ordinarily met with are recognized. In examining them certain general characters must be first noticed, including their amount; color and general aspect; mode of aggregation and deposit, whether amorphous, crystalline, or flocculent; and their apparent density and manner of precipitation, which may be observed by shaking up some of the

specimen and allowing it to stand. Next they must be submitted to the action of heat; nitric and acetic acids; and liquor potassæ, to test whether they are soluble by these agencies. Finally some of the sediment must be examined microscopically. The principal deposits, with their main characters, are as follows:

1. *Uric Acid*.—The urine containing this deposit is always very acid; generally it is mixed with urates and forms some time after the discharge of the urine. To the naked eye it is presented as more or less brown or brownish-red crystals, either forming a superficial film, adhering to the sides of the vessel, or falling as a heavy reddish deposit. The crystals are not soluble by heat or dilute acids, but are dissolved by strong alkalis. Chemically they may be recognized by the murexide test; microscopically they are distinguished by their color and form, the latter being primarily that of a rhombic prism or lozenge with pointed ends, but the crystals present numerous diversities, becoming ovoid or oval tablets, barrel-shaped, quadrangular, cubes, hexagonal, rodlike, stellate, rosette-like, etc. If a drop of liquor potassæ is added they are dissolved at once, but may be reprecipitated as hexagonal plates by adding a drop of acetic acid.

2. *Urates*.—These are very common even in health. As a rule they appear as *amorphous urates*, which consist of salts of potash, soda, ammonia, and lime, in variable proportions. The conditions favorable to their deposit are a high specific gravity, very acid reaction, and low temperature. They form more or less speedily after the discharge of the urine. The precipitate is quite amorphous, pulverulent, and loose; sinks with tolerable rapidity; and presents a variable color, such as milky, fawn, orange, pink, deep-red, or purplish, owing to the urates carrying down the urinary pigments. A film forms on the surface and sides of the containing glass. Heat dissolves the precipitate very speedily and completely, and so does liquor potassæ. Microscopically it appears as minute amorphous granules, of variable size, more or less dark and opaque. Urates of soda and ammonia are occasionally deposited in a *crystalline* form, the former as a whitish or yellowish sediment which sinks rapidly, and usually forms in the bladder; the latter generally is a dense white precipitate in urine which has decomposed and become strongly ammoniacal. They appear as globular, dark, opaque particles, from which project spiny crystals, straight or curved. Urate of ammonia also occurs as minute dumbbells.

3. *Oxalate of Lime*.—This forms but a very slight colorless deposit, usually in highly colored and acid urine. It crystallizes in fine lines on the interior of the glass, while the sediment is described by Dr. W. Roberts as consisting of two parts, a soft, pale gray, mucous-like portion at the bottom; and overlying this a snow-white, denser layer, with an undulating but sharply limited surface. Oxalate of lime is not dissolved by heat, acetic acid, or liquor potassæ, but is speedily soluble in mineral acids. It crystallizes either in the form of minute octahedra, very short in one axis; or as biconcave circular or oval disks with rounded margins. Under the microscope the former vary in appearance according to their position, but commonly they present a characteristic envelope-like appearance, exhibiting a square surface crossed diagonally by two lines. The latter are presented as dumbbells or ovoids and circles.

4. *Phosphates*.—These are deposited in alkaline urine as a rule, but occasionally in that which is neutral or faintly acid. They are not dissolved by boiling, which even increases the precipitate, giving rise to turbidity and causing the phosphates to fall in flakes. A drop of acid dissolves them instantly. Three varieties of phosphates are met with as urinary deposits. *a. Amorphous phosphate of lime or bone-earth*. This occurs as a whitish, light, flocculent sediment, with a superficial, iridescent film. Microscopically it presents irregular groups or patches of minute pale granules. *b. Crystallized phosphate of lime or stellar-phosphate*. Of rare oc-

currence, the crystals assume very various forms, but most of them resemble crystalline rods or needles, distinct or grouped in various ways. *c. Phosphate of ammonia and magnesia—Triple phosphate.* This is the most common form, being generally mixed with the amorphous phosphate. The precipitate is quite white, while brilliant colorless crystals are seen forming a film on the surface of the urine, and studding the sides of the glass. Under the microscope the crystals are usually very characteristic, appearing as triangular prisms with bevelled ends, but the primary form is liable to numerous variations.

5. *Carbonate of lime* occasionally falls as an amorphous deposit along with phosphates, and it is said to be now and then seen as crystals.

6. *Cystin*—The urine in which this rare substance is found is turbid on being passed, yellowish-green, having an oily aspect, and a peculiar sweet-brier odor. It is faintly acid, but very prone to decomposition, becoming green and evolving hydric sulphide. The deposit on standing appears abundant and light, but it weighs very little. This is not dissolved by heat or acetic acid, the latter causing increased precipitation, but it is soluble in mineral acids and caustic ammonia, being afterwards deposited from the latter solution by spontaneous evaporation. Microscopically the crystals appear as brilliant, colorless, hexagonal tablets, having a pearly lustre, often overlapping each other, or arranged in rosettes. Cystin also crystallizes in square prisms.

7. *Leucin—Tyrosin*.—These are stated to form a greenish-yellow sediment, tyrosin appearing under the microscope as delicate needles grouped in globular masses or bundles; leucin as dark globules, like fat.

8. *Fat*.—The chief condition in which a deposit of fat is observed is in the so-called *chylous urine*. It causes the liquid to assume a whitish, opaque, and milky aspect, which disappears on the addition of ether, the urine becoming transparent and clear. On standing the fat collects on the surface as a creamy layer. Under the microscope it appears in the form of extremely fine molecules.

The material named *Kiestein* may be also alluded to here. This is a peculiar whitish pellicle which sometimes forms on the surface of the urine after standing for a few days, and formerly supposed to be a characteristic sign of pregnancy, but it is now known that such is not the case. It consists of abundant fat-globules, crystals of phosphates, and the mould-fungus.

9. *Mucus and Epithelium*.—All urines contain a small quantity of these elements, the epithelium being shed from the genito-urinary passages. A light cloud subsides on standing, and the cells may be seen on microscopic examination, differing in character according to the part whence they are derived. In some cases mucus is in considerable quantity. It does not become ropy on adding liquor potassæ. In connection with certain diseased conditions, the epithelium of the bladder, ureters, pelvis of the kidney, or renal tubules may be present in the urine. The extrarenal cells present such various and curious shapes as to have been mistaken for cancer-cells. Renal epithelium cells may be separate or in patches, healthy in appearance, atrophied, granular, fatty, or quite disintegrated. Usually they are associated with casts.

10. *Pus*.—If pus is present in any quantity the urine is turbid on being passed, and does not become clear on boiling. A yellowish-white sediment forms, and if the urine is ammoniacal, or if solution of potash or ammonia is added, the pus assumes the characters of a ropy, viscid, tenacious material, which can be drawn out into strings. There is necessarily some albumen present, but it is never abundant when due to pus alone. Under the microscope pus-cells are seen, but they are frequently much altered in decomposed urine.

11. *Blood*.—Urine containing only a little blood may not give any indication of this to the naked eye, but it often presents a characteristic smoky appearance;

when more abundant the fluid has a more or less deep-pink or red color, until it may look like pure blood. Sometimes the blood is separate from the general mass of urine, and it may be in distinct coagula, or these may form on standing. A brownish, grumous, flocculent deposit falls after a time. The urine is necessarily albuminous. Red corpuscles are visible on microscopic examination, but if the urine is very dilute they are liable to be distended, and thus lose their normal characters; or if it is ammoniacal they speedily alter in shape and break up. Vermiform coagula or casts may be visible under the microscope. In certain conditions the urine contains more or less of the coloring matter of the blood, with albumen, but without corpuscles or fibrin.

12. *Renal Casts*.—Materials are exuded into the tubules in certain affections of the kidneys, which coagulate there, forming moulds or casts, and these are washed away by the urine, affording information, when viewed under the microscope, of the highest importance as regards the condition of these organs. As a rule they form but a slight cloudy sediment, but sometimes a considerable white deposit falls. Microscopic examination can alone positively reveal the presence of casts, and it is advisable to make this on a few occasions before coming to any positive conclusion, and also to repeat it frequently during the course of a case. In some instances the examination has to be conducted with the greatest care before they are detected, and it has been recommended to add acetic acid so as to precipitate uric acid, which will carry down the casts along with it.

The chief varieties met with are as follows, two or more kinds being commonly observed together: *a. Blood casts*, consisting either of accumulations of corpuscles, or of fibrinous casts studded with these. *b. Epithelial casts*, usually of some size, and presenting renal epithelium-cells on the surface or imbedded in their substance, frequently somewhat changed from their normal condition. *c. Granular casts*, usually of moderate size, and characterized by being more or less granular and opaque in appearance, the granules being either coarse or fine, and consisting of protein or fat; these are generally mixed to a variable degree with other elements, such as altered epithelium or oxalates, and also with free granules. On the addition of acetic acid under the microscope, if the granules consist of protein they disappear; if of fat they become more evident. Granular casts are divided by some authorities into *large* and *small*. *d. Fatty casts*, which exhibit scattered oil-globules, or collections of these as dark botryoidal masses. *e. Hyaline, transparent, or waxy casts*, varying considerably in diameter, and therefore divided into *large* and *small*; they have either a perfectly clear, transparent, and glassy aspect, or present faint markings on the surface, or a dimly molecular appearance. Sometimes a few nuclei or epithelium scales are visible upon them. In some cases they can only be seen after the addition of iodine or magenta solution. *f. Pus-casts*, composed of moulded accumulations of pus-corpuscles.

It is in connection with certain forms of Bright's disease of the kidney that casts are so important, and there are certain conclusions which may be arrived at as a general rule from studying their characters. 1. If they consist chiefly of the blood or epithelial varieties they indicate an early stage of disease, and the condition of the epithelium may be gathered from the characters of the cells on the casts. 2. Fine hyaline casts are supposed to come from tubules still covered with epithelium, and, when they follow the above, show that the disease is subsiding. 3. Large hyaline casts are believed to be formed in tubules deprived of their epithelium, and therefore to indicate grave organic changes in the kidneys. 4. Abundant granular casts also point to advanced disease, and they are frequently mixed with free granules. 5. Fatty casts are very serious, as proving fatty degeneration with destruction of the epithelium.

B. RENAL TUMOR.

A tumor connected with the kidney has the following general characters: 1. It is extra-pelvic, occupying mainly one or other lumbar region, and it cannot be separated from the mass of muscles behind. It, however, increases in a forward direction to a variable degree, sometimes attaining an enormous size and giving rise to general enlargement of the abdomen. 2. The shape is generally more or less that of the kidney, the borders being rounded, but irregularity is not unfrequently observed. 3. As a rule the consistence is firm; occasionally there is a feeling of softness, or even distinct fluctuation. 4. The tumor is almost or quite fixed, not being altered by manipulation or respiratory movements. 5. Percussion reveals dulness extending back to the spine, with tympanitic note in front, unless the tumor becomes extremely large. 6. In some cases it may be advisable to use the aspirateur or exploratory trocar.

It will be convenient in this connection to allude to certain peculiarities in the position and shape of the kidneys, which may give rise to forms of abdominal tumor. 1. *Movable or floating kidney.* Normally the kidneys are nearly fixed, but occasionally one or both, especially the right, are displaced and more or less freely mobile, floating about in the cavity of the abdomen. This has been by far most frequently observed in females, chiefly after repeated or difficult parturition. It has also been attributed to congenital looseness of the attachments; sudden or repeated violent effort; pressure by tight-lacing; rapid absorption of the investing adipose tissue in fat people; increase of weight during the menstrual periods from congestion, with consequent falling down of the kidneys; and to these organs being dragged down by a hernia. The kidney is felt as a tumor, having the exact form and feel of the healthy organ; and usually lying, when the patient is erect, in an oblique position, directed upwards and outwards, about midway between the margin of the thorax and the umbilicus. It is mobile in different directions by change of posture, manipulation, and respiratory movements. In some cases it may be grasped in the hand, this causing a peculiar sickening sensation to the patient. Percussion generally yields a muffled tympanitic sound. On examining the corresponding lumbar region, it will be found flattened or depressed and tympanitic on percussion, owing to the absence of the kidney. In some instances the displaced organ becomes enlarged and painful from time to time, it is supposed from pressure on its own duct leading to retention of urine and consequent inflammation. As a result of repeated attacks of this kind it may become permanently fixed by adhesions. Among the most frequent symptoms accompanying this abnormal condition are uneasiness or dragging pain, increased by walking or standing; neuralgic pains; disturbances of the alimentary canal; and other disorders due to compression or irritation. The urine is generally normal, but micturition may be frequent or painful. During the inflammatory attacks severe symptoms may be experienced. 2. Now and then the kidney is fixed in some abnormal position, this being either congenital or acquired. The displaced organ is recognized by presenting the characters of the normal kidney, though the shape is usually somewhat altered; and by the signs of its being absent from its proper situation. 3. *Horseshoe kidney.* Here the two organs are united by an isthmus passing across between their lower ends. This may possibly be felt in very thin persons with loose abdominal walls, and be mistaken for a tumor.

C. DISTENDED BLADDER.

A distended bladder is liable to be met with in medical practice, and it may simulate a tumor or general enlargement of the abdomen. Its characters are as

follows: *a.* It occupies mainly the hypogastrium, extending upwards and laterally to a variable extent, and being quite symmetrical. *b.* The shape is conical, the apex being upwards. *c.* Fluctuation is usually perceptible. *d.* There is dullness corresponding to the enlargement in position and shape, while laterally and above tympanic sound can be elicited. *e.* By examination per rectum the distended bladder may be felt. *f.* The use of the catheter must never be forgotten; or, if this cannot be passed, a small trocar or the aspirateur may be inserted above the pubes.

CHAPTER LVI.

ON CERTAIN ABNORMAL CONDITIONS OF THE URINE.

I. ALBUMINURIA.—The chief causes of albuminuria are: 1. Admixture of blood or some of its elements; chyle or lymph; pus from any source; or semen. 2. Renal congestion, particularly mechanical, due to obstructive cardiac diseases, chronic lung affections, or pressure upon the renal veins by a tumor or a pregnant uterus. 3. Acute febrile and inflammatory diseases, *e. g.*, the exanthemata, cholera, diphtheria, pyæmia, ague, pneumonia, serous inflammations, rheumatic fever, and the pyrexial condition which arises in the course of chronic diseases, such as phthisis. 4. Certain affections attended with an unhealthy state of the blood and relaxation of the tissues, as purpura and scurvy, these conditions being supposed also partly to account for its occurrence in pregnancy. 5. Acute and chronic Bright's disease, the albuminuria being then mainly due to organic changes in the kidneys. 6. Chronic lead-poisoning; also poisoning by inhalation of arseniuretted hydrogen or carbonic anhydride. 7. The use of a highly albuminous diet, as well as some forms of dyspepsia, may cause the urine to become slightly albuminous temporarily.

II. PYURIA.—The sources of pus in the urine are: 1. Abscess in the kidney. 2. Pyelitis. 3. Cystitis. 4. Urethral inflammation, especially gonorrhœa. 5. Leucorrhœa in females. 6. The rupture of any neighboring abscess into the urinary passages.

III. CHYLOUS URINE—CHYLURIA.—In this condition the urine generally presents a whitish, opaque, and milky aspect, but occasionally it is somewhat bloody. It contains albumen, fibrin, and fat in variable proportions. On standing a soft coagulum forms in the urine, while the fat collects on the surface as a creamy layer. The microscope reveals, in addition to the fat-molecules, granular nucleated corpuscles resembling chyle-corpuscles. Drs. Lewis and Cunningham have discovered a minute nematoid worm, to which they attribute the morbid condition. Chylous urine is chiefly met with in tropical climates, in some countries being endemic. Frequently considerable emaciation

and debility accompany this condition. The morbid elements in the urine are generally supposed to be derived directly from the blood in the kidneys; but Dr. W. Roberts believes that they come from the absorbent vessels in the urinary passages, which hypertrophy and give way, so that their contents become mixed with the urine.

IV. HÆMATURIA.—The blood in hæmaturia may come from the kidneys; pelves or ureters; bladder; urethra; or, in females, it may be connected with uterine and vaginal hæmorrhage, including ordinary menstruation. Excluding the latter the causes may be arranged thus: 1. Traumatic, *e. g.*, external injury affecting any part of the urinary apparatus; severe exertion and straining; injury by instruments; and laceration of the mucous membrane of the pelvis of the kidney, ureters, bladder, or urethra by a calculus. 2. Renal affections, *viz.*, congestion, including the active hyperæmia induced by certain articles, especially turpentine and cantharides; acute Bright's disease; suppurative nephritis; cancer; tubercle; renal embolism; minute calculi in the tubules; hydatids and other parasites. 3. Affections of either pelvis or ureter, *viz.*, cancer, tubercle, and parasitic diseases. 4. Affections of the bladder, *viz.*, congestion; acute cystitis; cancer, especially if of a villous and fungous nature; varicose veins. 5. Gonorrhœa and other urethral inflammations. 6. Endemic. This calls for special notice, being a form of hæmaturia observed in certain hot climates, especially the Mauritius, which has now been proved to be due to a small parasite (*bilharzia hæmatobia*), affecting the mucous membrane of the pelvis of the kidney and bladder. 7. Abnormal conditions of the blood, particularly in connection with purpura and scurvy, but also in malignant fevers, cholera, and other affections. 8. Vicarious, chiefly of the menstrual discharge. 9. Mental emotion in rare instances.

CHARACTERS.—For purposes of diagnosis it is highly important to notice whether blood in urine is constantly passed or only at intervals or under certain circumstances, as after riding, jolting, or taking certain articles; the mode of its discharge, whether before or after the urine or along with it, and also if it escapes independently of micturition; its amount; and the degree in which the urine and blood are mingled, whether they are intimately mixed, or more or less separate, or if the blood forms distinct coagula.

The characters of hæmaturia associated with most of the local lesions mentioned will be hereafter pointed out. At present all that need be said is that in renal hæmaturia the blood and urine are intimately mixed, the color being frequently smoky, and under the microscope minute moulded coagula or casts are usually visible, being in some cases numerous and decolorized, and accompanied by other renal structures; in bleeding from the pelves and ureters there is also an intimate mixture, and moulded vermiform coagula of considerable length may be discharged; in vesical hæmorrhage the blood is expelled chiefly or

only towards the end of the act of micturition; while in the urethral variety it may escape or be pressed out independently of micturition, and when urine is passed, blood precedes it or colors the first portion, and then the urine may become quite clear, blood again appearing at the close of the act. It may, however, flow back into the bladder from the urethra, and thus color the urine contained in this organ. Blood is sometimes purposely mixed with urine by hysterical patients and malingerers.

TREATMENT.—This must be conducted on exactly the same principles as that of other hæmorrhages. The most valuable internal astringents in hæmaturia are gallic or tannic acid, acetate of lead, or full doses of dilute sulphuric acid, combined with a little opium. The subcutaneous injection of ergotin deserves trial. The local use of cold is also highly beneficial often, in the form of ice to the loins, hypogastrium, or perineum, or of cold injections into the bladder; astringent injections are also permissible in some forms of vesical hæmorrhage. Dry cupping over the kidneys is frequently very useful when the blood comes from these organs, and occasionally local removal of blood is desirable. Pressure can be applied in the case of urethral hæmorrhage, and for this purpose it may be requisite to pass a catheter or sound. After renal hæmaturia it is important to watch the case for some time, as coagula may remain in the tubules and set up serious mischief.

V. HÆMATINURIA.—The urine occasionally contains more or less of the coloring matter and albumen of blood, but no corpuscles or fibrin, and to this condition the above term has been applied. This has been observed in connection with septic and malignant fevers; occasionally in purpura and scurvy; after poisoning by arseniuretted hydrogen or carbonic anhydride; and as a distinct affection, named *paroxysmal* or *intermittent hæmatinuria*, which seems to be chiefly caused originally by cold, but has also been attributed to injury over the renal region, and exposure to malaria. Pathologically it has been supposed to be due to the red corpuscles of the blood becoming disintegrated and dissolved; or to a nervous disturbance leading to temporary dilatation of the renal vessels, with the escape of some of their contents without rupture. It is highly probable that in some of the cases described corpuscles have been present in the urine originally, which have subsequently broken up and become dissolved.

Intermittent hæmatinuria comes on in sudden and usually irregular paroxysms, varying much in their frequency in different cases, only occurring during the day, and generally lasting from three to twelve hours; being preceded by a brief period by chills or rigors, languor, a sense of weight or dull pain over the kidneys, pain or stiffness in the legs, occasionally retraction of the testicles, nausea and vomiting. As a rule there is no pyrexia, and the temperature is in some cases below the normal. The urine becomes very dark, resembling porter or port-

wine; usually turbid; highly albuminous; and deposits a chocolate-colored sediment, which microscopically is seen to consist chiefly of granular matter, sometimes with hæmatin crystals, and often a few dark granular casts and oxalate of lime. In the intervals the urine seems quite normal, and the change to the healthy condition may be also quite sudden.

TREATMENT.—Full doses of quinine and iron have been found of most service in the treatment of this complaint.

CHAPTER LVII.

URÆMIA—URÆMIC POISONING.

THERE are certain symptoms grouped under the above term, which are the result of interference with the urinary functions. The conditions under which they arise may be stated generally as: 1. Diseases of the kidneys, especially Bright's disease, or nervous and vascular derangements of these organs which prevent them from doing their excretory work properly. 2. Obstruction of both ureters, so that the urine which is formed cannot escape into the bladder, though it is a remarkable fact that the symptoms are by no means characteristic in these cases. 3. Retention of the urine in the bladder from any cause, when the uræmia is supposed to be partly due to reabsorption of the urinary elements.

SYMPTOMS.—The clinical phenomena indicating uræmia are headache, sometimes fixed behind the neck or at the back of the orbits, or a sense of weight and pressure over the forehead or vertex; increased irritability of the voluntary muscles, evidenced by twitchings and fits of epileptiform convulsions, in the latter the face being pale and the pupils dilated, several fits sometimes occurring in rapid succession, with more or less stupor in the intervals, though consciousness is often partially restored; cerebral disturbance, usually in the direction of drowsiness, heaviness, and confusion of ideas, culminating in stupor or profound coma, delirium being only exceptionally observed; disturbance of vision, in the way of dimness of sight from time to time, or actual temporary blindness, there being no necessary organic changes revealed by the ophthalmoscope; deafness in rare instances; vomiting and diarrhœa, the matters discharged containing a quantity of ammonia, which may be perceptible to the smell; occasionally a urinous or ammoniacal odor of the breath and sweat; and possibly in exceptional cases paroxysms of dyspnœa. The exact combination of symptoms in any individual case varies considerably, as well as the mode

and rapidity of their onset. As a rule they come on gradually, beginning with headache and vomiting. Occasionally they commence with a perfectly sudden apoplectic form or epileptiform attack; or with blindness, or severe vomiting.

DIAGNOSIS.—Certain cases of uræmia are particularly liable to be mistaken for apoplexy, epilepsy, or opium-poisoning. The diagnostic points will be considered in a future chapter; at present I would only draw attention to the great importance of testing the urine in all cases of sudden insensibility. Cases of belladonna-poisoning may also simulate uræmia. The possibility of headache, disturbances of sight or hearing, and vomiting or diarrhœa being due to this cause must not be forgotten.

PATHOLOGY.—Most authorities regard the phenomena of uræmia as due to the accumulation in the blood of some poisonous materials, the circulation of which through the nervous and muscular systems occasions the effects described. Formerly they were attributed to non-excretion of urea, or to carbonate of ammonia resulting from the decomposition of this substance, but more recent observations seem to indicate that the chief poisonous agents are materials produced as the result of imperfect tissue-metamorphosis, which in the normal state of things should be further converted into urea and uric acid, and then excreted. The watery state of the blood; and œdema with anæmia of the brain-substance, have also been made to account for the phenomena of uræmia.

TREATMENT.—In the uræmic state the main indications are to remove any cause of urinary obstruction; to use measures for promoting excretion of urine, especially free dry-cupping or heat and moisture over the loins; to encourage the action of the skin by the aid of warm, vapor, or hot-air baths; and to treat symptoms. Inhalation of chloroform is useful for the epileptiform attacks. Venesection is often employed for apoplectic seizures, but is not admissible should there be advanced disease of the kidneys. Sinapisms may be applied to the neck and limbs. Vomiting must be treated in the usual way, but it is not advisable to check diarrhœa too speedily, and a brisk purgative is not unfrequently serviceable.

CHAPTER LVIII.

RENAL CONGESTION—EMBOLISM—INFARCTION.

ETIOLOGY.—Congestion of the kidneys may be active or mechanical. The former, also named catarrhal nephritis, may result from: 1. Any pyrexial condition, but especially that accompanying the exanthemata.

2. Cold and wet. 3. Certain medicines when used in excess, viz., cantharides, turpentine, nitre, cubeba, or copaiba. 4. Irritating urine in diabetes. 5. Morbid formations in the kidney, and emboli. 6. The early stage of inflammation. 7. It is said hypertrophy of the left ventricle; or possibly active dilatation of the vessels, as in cases of hysteria. Mechanical hyperæmia is a common consequence of: 1. Some cardiac or pulmonary disease interfering with the general venous circulation. 2. Pressure upon one or both renal veins, or upon the inferior vena cava above them, by abdominal tumors or a pregnant uterus.

ANATOMICAL CHARACTERS.—At first the kidneys present the characters ordinarily accompanying congestion, viz., enlargement and increase in weight; increased redness with points of vascularity, especially corresponding to the Malpighian bodies; and sometimes minute ecchymoses. In many forms of active hyperæmia there is a catarrhal state of the ducts of the pyramids, with shedding of epithelium. After mechanical congestion has lasted for some time, the usual serious changes are set up, leading to grave disorganization of the kidneys, which become contracted, indurated, sometimes granular or irregular, the cortical substance ultimately undergoing more or less atrophy. Microscopical examination reveals alteration in shape of the tubes, with thickening of their walls; changes in the epithelium, which is often destroyed; increase in the intertubular connective tissue; and permanent distension of the minute vessels. By some authorities this condition is looked upon as a form of Bright's disease.

Emboli not unfrequently lodge in the kidneys and give rise to infarctions, almost invariably confined to the cortical portion; differing in size; usually well-defined and wedge-shaped, with the base towards the surface. At first they are dark-red, but become decolorized from the centre towards the circumference, leaving yellow masses, which may be ultimately absorbed, depressed cicatrices alone remaining. Rarely an infarction softens and breaks down, forming a pseudo-abscess, or it is said that even actual pus may be produced.

SYMPTOMS.—Congestion of the kidneys is ordinarily indicated by the urine becoming diminished in quantity, high-colored, concentrated, and depositing urates abundantly on standing; afterwards containing some albumen, occasionally a little blood or clear fibrinous casts, with a few renal epithelium cells. In some forms of active hyperæmia, however, there is a copious flow of pale, watery urine, of low specific gravity. There may be a sense of fulness about the loins, or even a certain degree of heavy pain, and tenderness is frequently complained of. If the congestion subsides, the urine assumes its normal characters, but if it continues and leads to organic changes in the kidneys, this fluid presents more marked and permanent changes, to be hereafter considered. As a rule there are no symptoms indicative of renal embolism. If the embolus is large, it may cause a sudden severe pain in the renal region,

shooting towards the pelvis, with albuminuria or hæmaturia. Should an abscess form, there might be symptoms indicating this event.

TREATMENT.—If renal congestion calls for any interference, the main point is to remove or mitigate its cause as soon as possible, especially in the mechanical form. Rest in the recumbent posture; free dry cupping or heat and moisture over the loins, or sometimes the removal of a little blood; the warm bath; and active purgation are the chief direct remedies to be employed.

CHAPTER LIX.

SUPPURATIVE INFLAMMATION IN CONNECTION WITH THE KIDNEYS.

I. SUPPURATIVE NEPHRITIS—RENAL ABSCESS.

ETIOLOGY.—The causes of renal inflammation ending in suppuration are: 1. Injury from without. 2. Some direct irritation in the substance of the kidney, especially from a calculus. 3. Suppuration in the urinary passages, that in the kidney being set up either by extension or independently, the latter probably being the result of a kind of local pyæmia. 4. Embolism. 5. General pyæmia. 6. Extension of inflammation from surrounding structures.

ANATOMICAL CHARACTERS.—Whatever may be the origin of the inflammation, the alterations in the kidney are in most cases similar at first, viz., enlargement; hyperæmia, much blood flowing on section; and diminution in consistence. It is supposed that interstitial exudation then forms. Suppuration usually commences in separate points, which extend and coalesce so as to form one or more abscesses, these varying much in size. In most forms of the disease only one kidney is usually involved, and there is finally but a single abscess, which may attain large dimensions and open into the pelvis of the kidney; externally in the loins; into the peritoneum or subperitoneal tissue around; intestines; or thorax. Occasionally inspissation of the contents takes place, followed by caseation and calcification, a cure being thus effected. In pyæmia there are numerous scattered abscesses of small size. It is said that pus is sometimes infiltrated through the kidneys; also that it may form within the tubules.

SYMPTOMS.—Acute suppurative nephritis is generally accompanied with local pain in the corresponding lumbar region often severe, increased by movement, frequently shooting towards the bladder, testis, or thigh; as well as with tenderness. The testis may be drawn up. The urine is diminished in quantity and concentrated, or even actually

suppressed, frequently containing some blood or merely a little albumen, but these may be quite absent. As a rule there are distinct rigors, followed by marked pyrexia, which has a great tendency to assume a typhoid type, especially when suppuration commences, this being accompanied with repeated shiverings. Sympathetic vomiting is not uncommon. Uræmic symptoms are also liable to arise. Should a large abscess form, it presents as an elastic or fluctuating fulness or tumor, usually in the lumbar region, where it may afterwards burst. If it opens into the pelvis of the kidney, a copious discharge of pus takes place along with the urine, and this may afterwards continue persistently or at intervals. Various symptoms may result from the bursting of an abscess into other parts. When the kidneys are involved in pyæmia, there are no prominent local signs; and such is often the case also when the renal disease follows some morbid condition of the urinary passages, when it frequently runs a somewhat chronic course.

II. PYELITIS—INFLAMMATION OF THE PELVIS OF THE KIDNEY—PYONEPHROSIS.

ETIOLOGY.—Pyelitis signifies inflammation involving the mucous lining of the pelvis and infundibula of the kidney. Its important causes are: 1. Direct irritation by foreign matters lodged there, especially a calculus, or gravel, parasites, and blood-clots. 2. Morbid deposits, viz., cancer, tubercle. 3. Extension of inflammation from the bladder along the ureter. 4. Irritation by accumulated urine, resulting from closure of the ureter by pressure or internal obstruction, especially if this has become decomposed. In rare instances pyelitis seems to set in idiopathically, from exposure to cold and wet or other injurious influences. A certain degree of it may also arise in the course of various febrile affections; in organic affections of the kidneys; diabetes; and from the use of certain drugs, such as turpentine or cantharides.

ANATOMICAL CHARACTERS.—Pyelitis may be acute or chronic, and the appearances vary accordingly. The acute form, in which the inflammation is usually catarrhal, is characterized by injection of the membrane, occasionally with slight ecchymosis, or extravasations of blood; relaxation and softening; shedding of epithelium; and subsequently discharge of purulent mucus or actual pus. Occasionally diphtheritic or croupous inflammation is observed, along with a similar condition of other mucous surfaces. The chronic variety may either follow the acute or commence as such. The membrane is then pale, though some of its veins may be permanently distended; often gray or slate-colored from pigment; much thickened and firm. Pus is constantly formed, and if there is no obstruction it flows away with the urine; should there be an impediment to its escape it accumulates in the pelvis, which it distends more and more, giving rise to the condition named *pyonephrosis*: here it is commonly mixed with other materials, such as urine, which is

usually decomposed and ammoniacal, deposits or incrustations of uric acid and urates or phosphates, calculi or other materials which may have excited the pyelitis, or blood. By degrees the substance of the kidney is compressed and invaded upon, until ultimately it may be completely destroyed, a mere sac remaining containing pus and other matters. In other instances distinct disease is set up in different parts of the kidney—*pyelo-nephritis*; or it may simply shrivel up and atrophy. The accumulation may burst in any of the directions which renal abscess takes; or occasionally ulceration of the mucous membrane is set up by some foreign body, and perforation occurs before any particular distension is observed. In some cases the pus becomes inspissated, and abundant calcareous deposits are formed, or even imperfect bone, the cavity contracting and shrivelling up.

SYMPTOMS.—In the majority of cases pyelitis is preceded or accompanied by symptoms due to its cause, *e. g.*, those of calculus or disease of the bladder. The local clinical phenomena associated with this complaint are uneasiness or pain over one or both lumbar regions, often of an aching character or shooting downwards, with tenderness and a sense of weakness; generally frequent micturition; changes in the urine; and in some instances the presence of a tumor. The alterations in the urine may be the only deviation from health. It is often increased in quantity; generally acid; and at first contains a little blood intimately mixed, with mucus and the variously-shaped epithelium-cells detached from the pelvis and infundibula; gradually it becomes mixed more and more with pus, until finally this may be present in large quantity, and it comes away persistently so long as there is no obstruction to its escape. Albumen is only observed in proportion to the admixture of blood and pus. Some important differences are noticed in the characters of the urine under certain circumstances. If the flow of pus along the ureter is impeded in any way, as by a calculus, the urine may become quite natural, provided only one kidney is involved; if both are implicated, or if the closure of the ureter is incomplete, the quantity of pus is merely lessened. Should the obstruction be removed, a copious flow of purulent urine again takes place; this may be repeated from time to time, or the obstruction may remain permanently. Further, if the urine is retained it tends to decompose, and is then frequently discharged in an ammoniacal state. Should materials accumulate in the pelvis of the kidney, a fulness or tumor is formed, having the general characters of renal enlargement, with an elastic or fluctuating feel. This will be subject to increase in size should there be obstruction in the ureter from time to time, becoming then also more painful and tender, and it may suddenly subside as the impediment is removed. Occasionally it attains very large dimensions.

The general symptoms are those of pyrexia in the acute form, preceded by rigors. When suppuration is set up there are commonly

repeated rigors, in some cases recurring at regular intervals, and in prolonged cases signs of hectic fever appear. The bowels are often disturbed, there being either diarrhœa or obstinate constipation, the latter due to pressure on the colon. If the kidneys become independently implicated, symptoms of Bright's disease arise. In some cases recovery takes place, provided only one kidney is affected and the cause of the complaint can be removed, though often with complete destruction of the involved organ. Most commonly, however, death ultimately happens from gradual exhaustion. This event may result also from perforation or rupture of the distended pelvis, the symptoms differing according to the direction in which the opening takes place.

III. PERINEPHRITIS.

In this form of inflammation the tissue surrounding the kidney is implicated, the process usually terminating in suppuration. It is caused by injury, cold, or previous suppurative nephritis or pyelitis. Clinically it presents a history very much like that of the diseases just mentioned, but is distinguished by the absence of any disturbance of the renal functions, or of any changes in the urine. There may also be a greater intensity and superficialness of the pain and tenderness, with more marked exacerbation on movement; and subcutaneous œdema in one lumbar region. The abscess generally opens behind, but may rupture in various other directions.

CHAPTER LX.

BRIGHT'S DISEASE.

NUMEROUS and diverse have been the arrangements by different authors of the morbid conditions included within the term "Bright's disease." In general language it is employed to signify any structural disease of the kidneys which leads to albuminuria and dropsy. Primarily it is divided into *acute* and *chronic* forms.

I. ACUTE BRIGHT'S DISEASE—ACUTE DESQUAMATIVE NEPHRITIS— ACUTE TUBAL NEPHRITIS.

ETIOLOGY.—In the large majority of cases acute Bright's disease is associated with scarlatina; or results from "taking cold." It may follow excessive drinking; or be set up occasionally in the course of other exanthemata besides scarlet fever, *e. g.*, measles or typhus fever; in the collapse stage of cholera; it is said after ague or exposure to malaria;

or during pregnancy. There is good reason for believing that the pathological cause in many of these conditions is that the functions of the kidneys are abnormally exercised, these organs having to excrete materials either formed in excess or of an unusual character, or such as ought to be removed by the skin. The chief *predisposing causes* are the early period of life; want of cleanliness of the skin; intemperate habits; and occupations which involve exposure. In some cases Bright's disease has probably existed in a chronic form without giving rise to any evident symptoms, until one of the above causes makes it assume an acute character.

ANATOMICAL CHARACTERS.—The kidneys are enlarged and increased in weight, in most cases considerably. At first they are deeply congested, the surface and a section presenting a deep dusky-red color, with darker spots corresponding to the Malpighian corpuscles or to minute hæmorrhages, while the superficial veins are distended, and a quantity of bloody fluid escapes on section. The surface is quite smooth, and the capsule easily separated. The enlargement is mainly due to increase in the cortical substance, which is found to be much thickened, softened, lacerable, and friable. The pelvis and infundibula are also injected, and a bloody liquid is often found here. In a more advanced stage the color of the cortical portion changes, becoming either more or less white, yellowish-white, or pale-buff, opaque and dotted, or presenting a mottled surface of red and white; while the pyramids remain dark-red and striated, red lines radiating in a fanlike manner from their bases.

Microscopic examination reveals capillary distension; fibrinous exudation within the tubules of the kidney; as well as red blood-corpuscles, with extremely abundant epithelium-cells, which become detached, rapidly increase in number, and accumulate in the tubules, many of which appear crammed full of cells, and some dilated. Most of the epithelium particles are altered, being enlarged; cloudy or opaque; more or less granular from the presence of protein granules or sometimes of fat; or quite disintegrated; there being also abundant young cells resulting from proliferation. They accumulate more and more as the disease advances, and hence the pale color, this also partly resulting from compression of the vessels. In some tubules the epithelium may be completely detached, only hyaline fibrinous moulds remaining. These changes are much more evident in the cortical than the pyramidal portion of the kidneys.

In fatal cases morbid appearances due to complications are commonly observed, especially serous inflammations, endocarditis, pneumonia, or bronchitis. Dropsy and its consequences are generally present. In some cases the heart is hypertrophied.

PATHOLOGY.—Acute Bright's disease is essentially an intense catarrhal inflammation of the tubules of the kidney. As a result, in addi-

tion to capillary engorgement and rupture, the epithelial cells undergo rapid proliferation. The renal functions are greatly impeded, and hence the blood becomes overloaded with excrementitious matters, as well as watery and highly deficient in albumen and red corpuscles. The elements formed in the kidneys are washed away by the urine, in which they are visible on microscopic examination.

SYMPTOMS.—As a rule the onset of acute Bright's disease is definite and marked; frequently it sets in with chilliness or rigors, general pains, headache, and nausea or severe vomiting; in other cases dropsy rapidly extending is the earliest symptom observed; and occasionally uræmic phenomena first attract attention. When the disease is established, the characteristic clinical signs include peculiar changes in the urine; more or less general anasarca, frequently with effusion into serous cavities or œdema of organs; extreme pallor, puffiness, and dryness of the skin; a tendency to uræmia, serous inflammations, endocarditis, pneumonia, or bronchitis; and pyrexia. Generally there is some dull pain with tenderness over the renal regions, but these sensations are not prominent; micturition also is in most cases too frequent, especially at night, though the quantity of urine passed is greatly diminished, and sometimes it is almost or quite suppressed. The urine which is discharged has the following characters: It is dark in color, from excess of pigment and the presence of blood, the latter often causing it to assume a smoky, brown, or dark-red tint; the specific gravity is high, 1025 to 1030, 1040, or more; the reaction is almost always acid; the normal odor is replaced by one compared to that of beef tea, or the washings of flesh or whey; an abundant sediment forms, brown and flocculent; while urates are frequently deposited. Chemical examination reveals abundance of albumen, the urine sometimes becoming almost solid on boiling. The excretion of urea and inorganic salts is greatly diminished, but uric acid is about normal. Under the microscope the deposit is seen to consist of red blood-corpuscles, in some cases much altered in appearance; renal epithelium-cells, usually more or less swollen, cloudy or granular, or partially disintegrated; remnants of these in the form of nuclei or granular matter; extra-renal epithelium; amorphous particles of fibrin; and numerous casts, chiefly of the *blood* and *epithelial* varieties at first, and of medium size, with a few large or small *hyaline* and some opaque *granular* casts. The casts change during the progress of a case, and it is very important to study these alterations: not uncommonly a little fat appears in connection with these and the epithelium, which disappears as the disease subsides.

Dropsy often comes on with great rapidity, in some cases rendering a patient irre recognizable in a few hours, while the face assumes a characteristic blanched, pasty, and puffy aspect. Hydrothorax, ascites, and œdema of the lungs are common, and œdema glottidis sometimes proves highly dangerous. The patient generally feels dull and heavy, or com-

plaints of headache, while distinct uræmic symptoms are liable to arise at any time. Inflammatory complications will be indicated by their special signs, those chiefly to be borne in mind being pericarditis, pleurisy, peritonitis, endocarditis, bronchitis, and pneumonia. Fever is often high, with a full and hard pulse; while there is complete loss of appetite, great thirst, and usually constipation. The blood is hyperinotic.

Dr. Sibson (Lumleian Lectures, 1874) has drawn special attention to certain signs in connection with the heart and vessels in cases of Bright's disease, and in the acute form he frequently found the following: Tension and hardness of the radial artery; a second beat over the aorta in the first and second right spaces; an intensified metallic second sound and muffled first sound over the aorta; reduplication of the first sound, variously distributed, but usually best heard over the septum ventriculorum; and in most cases a doubled second sound. The left ventricle was hypertrophied in many instances, but in others this effect of Bright's disease was prevented by the coexistence of some wasting and exhausting complaint.

COURSE, DURATION, AND TERMINATIONS.—Acute Bright's disease presents considerable variations in these respects. Recovery may follow speedily or gradually. Complete restoration is indicated by disappearance of the dropsy; subsidence of pyrexia and return of the functional activity of the skin; and by the urine becoming abundant, clear, and of low specific gravity, while blood, albumen, and casts disappear, many of the latter assuming the *hyaline* character during the progress towards convalescence. Some fatty changes may be noticed, but they disappear in a favorable case. As a rule the dropsy subsides before the albuminuria, and the latter may hold on for a considerable time. Not uncommonly acute Bright's disease passes into a chronic form. Death may result from dropsy affecting important parts, such as the glottis, inflammatory complications, or uræmia.

II. CHRONIC BRIGHT'S DISEASE.

There are certain well-marked varieties of this complaint recognized by most authors. The subject will, perhaps, be presented most clearly by first pointing out the general causes and clinical features of the disease, and then considering the main facts pertaining to each special type.

GENERAL ETIOLOGY.—The chief causes of chronic Bright's disease are: 1. A previous acute attack. 2. Constant or frequent exposure to cold, wet, or sudden changes of temperature. 3. Abuse of alcohol, particularly of ardent spirits. Dr. Dickinson has, however, attempted to prove that this cause has been greatly exaggerated. 4. Some constitutional diathesis or blood-poisoning, especially gout, syphilis, tuber-

cular or scrofulous disease, chronic saturnism, and the fatty diathesis. The opinion is held by some pathologists that all forms of Bright's disease are of constitutional origin, the renal affection being but a local development of a general disorder. 5. Chronic disease of the pelvis of the kidney, bladder, urethra, or prostate gland. 6. Pregnancy.

Predisposing Causes.—Chronic Bright's disease is more prevalent among males, probably from their more frequent exposure to its exciting causes; in adults; in those whose occupation involves exposure to cold and wet or sudden changes (e. g., cabmen, laborers, puddlers, workers in glass), or greater temptations to intemperance; and among the poor. Want of cleanliness of the skin is a predisposing cause, and this is often combined with exposure and intemperance, the three together being peculiarly prone to originate Bright's disease.

GENERAL CLINICAL HISTORY.—In general terms the symptoms of chronic Bright's disease comprehend morbid conditions of the urine, especially albuminuria, the presence of casts and renal epithelium, sometimes of blood, and diminution in the quantity of urea and other urinary ingredients excreted; frequent micturition, particularly at night; dropsical accumulations, liable to come and go, or to alter their seat rapidly; deficient action of the skin, which is almost always dry and often rough and harsh; changes in the blood, which becomes hypochræmic and deficient in albumen and red corpuscles, with consequent pallor or sallowness of the skin, shortness of breath, and other symptoms, while excretory elements accumulate in it. Sometimes uneasiness or tenderness is experienced over the region of the kidneys. Headache and giddiness are frequently complained of, and serious uræmic symptoms are liable to arise at any moment. Serous inflammations, endocarditis, bronchitis, and pneumonia, are also to be feared. Derangements of the digestive organs are very common, in the way of loss of appetite, dyspeptic symptoms, nausea or vomiting, flatulence, and irregularities of the bowels. Other complications liable to be met with are phthisis; cardiac disease; morbid conditions of the vessels and hepatic affections. In certain forms of Bright's disease apoplexy is frequent. The signs in connection with the heart and vessels described under acute Bright's disease were also noticed by Sibson in many cases of the different chronic forms, which likewise tend to originate hypertrophy of the left ventricle.

As regards the mode of onset, chronic Bright's disease not uncommonly remains after an acute attack; in most cases, however, it sets in gradually, and the affection may be quite latent until some grave uræmic or other symptoms reveal the serious condition present. In other instances there may only be albuminuria or slight dropsy. The disease is generally subject to remissions and subacute or acute exacerbations, the latter often coming on from a slight, or even without any obvious cause. The duration is very variable, some cases lasting many

years, and it differs in the several forms. Death is usually hastened at the close by uræmia; serous inflammations; pneumonia or bronchitis; dropsy, either on account of its dangerous situation or from its exciting erysipelas or gangrene; or apoplexy. A few cases terminate gradually by asthenia; in others death results from independent complications, such as phthisis. Recovery may ensue even after the disease has existed for a considerable time.

It is requisite to draw special attention to certain changes in connection with the eye. The occurrence of temporary attacks of disturbance of vision in uræmia has already been alluded to. A form of amaurosis is, however, met with in Bright's disease, attended with definite morbid changes in the retina, as observed with the ophthalmoscope, viz., albuminuric retinitis and hæmorrhages. The loss of sight under these circumstances creeps on slowly, and is permanent, though usually liable to sudden increase from various causes, with subsequent improvement. At first the appearances noticed are increased vascularity, with enlargement and tortuosity of the retinal veins, but shrinking of the arteries; and slight swelling around the disk, the margin of which becomes indistinct, while it becomes suffused and dark red, a gray filmy exudation afterwards forming. The more characteristic appearances, however, are noticed later on, being due to the presence of numerous whitish or yellowish-white, brilliant-looking spots or patches around the disk; with hæmorrhagic extravasations into the retina in the same locality. By the increase and union of the patches the disk is often surrounded with a zone, "the inner line of which is irregularly circular, or melts into the gray interval and the disk itself, while the outer presents salient angles, which correspond to the course of the larger vessels" (Allbutt). Whitish streaks are also seen radiating outwards along the vessels and nerve-fibres. In course of time the disk is itself invaded by the spots and hæmorrhages. Some suppose that the white spots always result from changes in blood-clots, but probably most of them are the result of independent exudation. Ultimately these may be absorbed, many of the vessels being obliterated or removed, causing retinal anæmia, while it is then seen that the choroid has undergone marked changes, and that it presents yellow patches. Important structural changes are set up in the retina, choroid, and vitreous body. Both eyes are always involved, but not to the same degree.

These ocular changes are unquestionably found most frequently and distinctly in connection with the "granular contracted," kidney, but they have been also noticed in other forms. As to their immediate cause, they have been attributed to hypertrophy of the heart accompanying renal disease; to some constitutional condition, attended with changes in the vessels generally; to alterations in the blood, viz., uræmia or deficiency of albumen; or to extension of disease along the optic nerve from the brain.

Having given this general outline of Bright's disease, the prominent characters of the several varieties will now be pointed out.

1. LARGE, WHITE, SMOOTH KIDNEY—CHRONIC DESQUAMATIVE OR TUBAL NEPHRITIS.

ETIOLOGY.—This form is most frequently a sequel of the acute disease. It may come on gradually from taking cold; repeated pregnancies, or in the course of phthisis. It is chiefly met with in comparatively young persons.

ANATOMICAL CHARACTERS.—The kidneys are **enlarged and heavy**, their surface being smooth and pale, but variegated with vessels; the capsule is readily separated and unaltered, or somewhat opaque. A section shows great thickening of the cortical substance, which is white or yellowish-white and opaque, often also presenting numerous small yellow spots or streaks, due to fatty degeneration—"granular fatty kidney" (Johnson). The consistence is diminished. The pyramids retain their normal color, and contrast markedly with the cortex, though they are also affected to a less degree. Microscopic examination reveals enlargement of many of the tubes, which contain a great number of epithelium particles, with exudation. The cells are always much altered, being swollen, clouded, more or less granular, frequently containing fat or oil-globules, or being quite disintegrated, so that only a granular debris remains, with masses of fat and oil-globules. Some tubules may be quite denuded and empty, or only present hyaline fibrinous moulds. The Malpighian corpuscles are either normal in size or a little enlarged, and their capsules are thin.

In very chronic cases this form of kidney occasionally gradually contracts and wastes, and it may become markedly small, owing to disintegration and absorption of portions of the cortical substance. The capsule is then more or less thickened, opaque, and adherent at parts; superficial depressions form, causing a somewhat granular appearance; while there is some increase in the interstitial tissue, with thickening of the bloodvessels.

PATHOLOGY.—The generally accepted view of the pathology of the large white kidney is, that it is the result of *chronic tubular nephritis*, attended with great increase and desquamation of the epithelium, the cells of which gradually undergo changes, ending in their complete fatty transformation and destruction. More or less loss of tissue with atrophy may follow in course of time.

SYMPTOMS.—Either remaining after an acute attack, as frequently happens, or being chronic from the outset, this variety has the following clinical features: The urine is usually deficient in quantity; pale and often somewhat turbid, depositing a whitish sediment, or from time to time being smoky or tinged with blood; of normal or rather high

specific gravity; and it contains a considerable quantity of albumen, as well as various casts, with renal epithelium or its remains. The microscopic elements are not nearly so abundant as in the acute disease; by studying their prevailing characters much information may be gained as to the exact state of the kidneys. The chief casts met with are *epithelial*, the epithelium-cells being always more or less altered; *granular*; *large or small hyaline*; and *fatty*, as the renal structures undergo fatty changes. Anasarca is generally a prominent symptom, with serous effusions. The general surface, especially the face, presents the characteristic dull-white, puffy and pasty aspect, being often also smooth and glossy, these appearances being more marked as fatty degeneration proceeds. There is considerable tendency to uræmia and serous inflammations. Dr. Johnson states that mucous hæmorrhages are frequent in the advanced stages, especially epistaxis. Exacerbations are very liable to arise from time to time.

2. GRANULAR CONTRACTED, OR CIRRHOTIC KIDNEY—CHRONIC INTERSTITIAL NEPHRITIS.

ETIOLOGY.—In this variety the onset is always very chronic and insidious, without any obvious exciting cause. The contracted kidney is chiefly associated with gout; chronic lead-poisoning; chronic alcoholism; a tendency to general degenerative changes; or, it is said, repeated exposure to cold. The subjects of this form of renal disease are usually advanced in years.

ANATOMICAL CHARACTERS.—The prominent changes in the cirrhotic kidney are gradual contraction and atrophy, until the organ may weigh only an ounce or two; granulation of the surface, the granules ranging from the size of a pin's head to that of a pea or more, there being also irregular depressions, giving rise to a lobular appearance; thickening, opacity, and adhesion of the capsule, which is inseparable and sinks into the depressions; increased resistance and toughness of the renal tissue. These changes are advanced to very different degrees in different cases. On section it is seen that the cortical substance is chiefly wasted, having in some instances almost completely disappeared, what remains being of a red or brownish-red color and coarsely granular. There may be signs of fatty degeneration. Cysts are frequently observed, varying in size from very minute points to spaces as large as a nut or larger, and containing an albuminous fluid. In the gouty kidney a white deposit of urates forms within the tubules.

The intimate changes consist in a great increase of the intertubular fibrous tissue; with consequent alterations in the tubules, Malpighian corpuscles and vessels. Many of the tubules are denuded of their epithelium, contracted, or obliterated; others are blocked up with disintegrated epithelium-cells; while still others contain clear fibrinous moulds.

Fat-granules and oil-globules are often visible. The Malpighian bodies appear shrunken and abnormally close together, their inclosed glomeruli being more or less compressed by fibrous tissue. Many vessels are obliterated and the walls of the smaller arteries are thickened, hence it is difficult to inject the kidney through its main artery. The cysts so frequently seen are probably due to obstruction or constriction of the ducts at intervals, with distension of the intervening portions.

PATHOLOGY.—It is in connection with the cirrhotic kidney that important differences of opinion have arisen as regards pathological questions. With respect to its nature and mode of origin, German authorities consider it as being merely a later stage of the large white kidney which, if it only lasts long enough, will become atrophied and granular, and some of their pathologists describe several stages in the progress of the morbid alterations in the kidneys. Though recognizing the fact that now and then the large kidney does waste and become granular, yet most English writers are of opinion that the true cirrhotic kidney does not so originate, but that it is the result of chronic interstitial nephritis attended with proliferation of the intertubular connective tissue, which becomes much increased and compresses surrounding structures. Dr. George Johnson, however, considers that the epithelial cells are first affected, undergoing degeneration from having to perform unusual excretory work. Dr. Dickinson believes that the disease begins superficially immediately under the capsule and gradually extends inwards.

Before alluding to a view more recently advanced, it will be convenient to consider more particularly the morbid conditions of the heart and arteries which may be induced by Bright's disease, and which are found with special frequency associated with the contracted kidney. It must be borne in mind that the heart may be primarily diseased, and by inducing mechanical congestion may lead to organic changes in the kidneys ending in contraction and atrophy, this condition being, as previously stated, regarded by some pathologists as a variety of Bright's disease. Again, affections of the cardiac valves may coexist with renal disease independently, or as the result of the same constitutional dyscrasia; or they may be the consequence of endocarditis complicating Bright's disease. It is, however, to cardiac hypertrophy, especially involving the left ventricle, and presumed to be a secondary result of the renal disease, that it becomes requisite to draw particular attention. There can be no doubt but that this condition of the heart does arise in many cases of chronic Bright's disease, and the question is, how is it originated? Formerly it was attributed to the altered state of the blood, which was supposed to exercise an undue stimulation upon the heart, or to pass with difficulty through the capillaries, thus causing the heart to act with excessive vigor and so to become hypertrophied. Traube advanced the opinion that destruction of the renal

secreting tissue and obstruction to the circulation in the kidney lead to the hypertrophy, chiefly because under such circumstances a sufficient amount of water is not removed from the blood, and thus the arterial tension is increased. Dr. George Johnson made the important discovery that the walls of the small arteries, not only in the kidneys, but also in various other structures throughout the body, are greatly thickened; he believes that this thickening is due to hypertrophy of the muscular coat, which is the consequence of the arteries opposing the passage into the tissues of the unhealthy blood associated with Bright's disease. Owing to this hypertrophy the walls of the heart become also hypertrophied, in order to overcome the resistance thus offered.

Still more recently Sir W. Gull and Dr. Sutton have denied that the thickening of the small arteries is due to muscular hypertrophy; they affirm from their observations that these and the capillaries throughout the body become the seat of a peculiar *hyaline-fibroid* change, which leads to thickening of their walls with loss of elasticity, and they attribute the cardiac hypertrophy to this *arterio-capillary fibrosis*, as it is termed. On these observations they found another view as to the pathology of the granular kidney, viz., that it is but a part of a general morbid condition, beginning in the smaller vessels and affecting these throughout the body, which leads to atrophy of the tissues. In their opinion the vascular changes outside the kidneys are not the secondary result of the renal disease, but merely a part of the general disorder. The whole question is still in a state of great uncertainty.

SYMPTOMS.—The contracted kidney may be clinically latent for a very long period. As regards the urine, this is as a rule abundant, being in some cases very copious; of light color and low specific gravity; while it contains comparatively little albumen, or even none at all at times; there being also but few or no casts, which are chiefly *hyaline* and *granular*, with but little epithelium or fat. At the close the urine often becomes very scanty or suppressed. Dropsy is absent in a considerable number of cases from first to last, and generally is but slight or only observed at intervals. The skin is dry and harsh, but does not exhibit the pale pasty aspect, and the face has often a sallow pinched appearance. In most cases there is marked debility and constitutional cachexia. Dyspeptic disturbances are frequently very prominent. The complications most liable to be met with are cardiac hypertrophy and morbid conditions of the vessels, the latter not uncommonly leading to apoplexy. Uræmia, serous, and pulmonary inflammations are much less frequent than in connection with the large white kidney.

3. FATTY KIDNEY.

Fatty changes are observed in connection with all forms of Bright's

disease, but some authorities are of opinion that the kidney may become primarily the seat of a *fatty infiltration*, the renal cells being loaded with fat, the liver being in most cases affected at the same time. Dr. Johnson applies the terms *simple fat kidney* or *general fatty infiltration of the kidney* to this condition. It is stated to be associated with any of the usual causes of fatty infiltration. The kidneys are frequently enlarged, their cortical substance being uniformly pale or mottled with red, and occasionally hæmorrhagic spots are observed. The consistence is diminished, the kidney having often an oëlematous feel and appearance. The microscope shows uniform distension of the renal cells with oil. There may be albuminuria and other symptoms of renal disease, but generally no obvious signs of functional derangement of the kidneys are observed (Johnson).

4. LARDACEOUS OR ALBUMINOID KIDNEY.

Most writers now classify the lardaceous kidney as a form of Bright's disease. Its etiology and pathology are those of the general disease. The affected organs are usually enlarged, and their surface is smooth, the capsule separating readily. The consistence is very tough and hard. A section is sharp-cut, and shows the cortical substance pale, anæmic, waxy, and translucent, often dotted over with glistening spots which correspond to the infiltrated Malpighian bodies, in which the deposit first occurs. The cones seem natural. The usual chemical reactions of albuminoid material are yielded. The renal cells are often cloudy, withered, or fatty, but they are stated not to afford the tests of albuminoid deposit. The intertubular tissue is generally increased. Transparent fibrinous moulds are found in some of the tubules. In advanced cases the kidneys may become much contracted and irregular.

SYMPTOMS.—The local clinical signs which indicate implication of the kidneys in albuminoid disease, which have been mainly pointed out by Dr. Grainger Stewart, are as follows: The urine becomes very copious at first, pale and watery, depositing scarcely any sediment, of low specific gravity, this varying from 1005 to 1012 or 1015. At this time albumen is either absent altogether or is present only in very small quantity. Later on it increases, often becoming exceedingly abundant, while the urine is much diminished in quantity, and its specific gravity considerably raised. In the early period casts are few in number, consisting mainly of small hyaline and finely-granular varieties. There may be some epithelial scales upon them; or these may be separate, being usually wasted or containing oil-globules. Dr. Grainger Stewart states that the epithelial particles occasionally yield the reaction of albuminoid substance. In the stage of contraction there may be considerable urinary sediment, in which are numerous large hyaline and granular casts. Dropsy is a common symptom, but in many instances it is

probably to a great extent due to the general constitutional condition. Uræmic phenomena are very rare.

5. MIXED TYPES.

It need only be remarked here that kidneys are sometimes met with presenting combinations of the morbid changes described. Thus there may be a combination of the interstitial and tubal forms of disease; and Dr. Dickinson attributes the contraction of the latter in the later stages to supervention of lardaceous disease in many cases; this may also accompany the large white kidney. As already remarked, fatty changes are common in all forms of Bright's disease.

CHAPTER LXI.

ON CERTAIN RARE DISEASES OF THE KIDNEYS.

I. CANCEROUS AND OTHER GROWTHS.

OF rare occurrence, renal cancer may be primary or secondary. It is most frequent in very young children or after adult age, and in males. The variety met with is almost invariably encephaloid. The deposit is always in the nodular form when secondary, but when primary it may be either nodular or infiltrated. Secondary cancer does not attain any large size, but primary cancer frequently grows to enormous dimensions, usually giving rise to an irregular tumor. The consistence varies considerably, being sometimes very soft and almost fluctuating, while it is rarely uniform throughout. Hæmorrhage, softening, degeneration, and suppuration are liable to occur in the growth. The uninvolved renal texture is generally atrophied from pressure, or otherwise altered. Thickening of the capsule and adhesions are generally observed; while adjoining structures are frequently displaced or destroyed from pressure, the colon being always in front of the tumor. The pelvis of the kidney and ureter are often involved. In the great majority of cases only one kidney is affected. Secondary deposits are common, especially in the neighboring glands.

SYMPTOMS.—The important clinical signs of renal cancer are severe pain in the lumbar region, generally shooting to the hypochondrium and thigh or in other directions, and subject to remissions or intermissions; tenderness; hæmaturia, in many cases profuse and irregularly intermittent, and occurring without any obvious cause; and the presence of a renal tumor, the special characters of which are the rapidity of its growth and the great size which it may attain, especially in chil-

dren; its absolute immobility; as a rule its irregularly lobular feel: and its more or less firm though unequal consistence. Occasionally there is an obscure sense of fluctuation in some parts. In some cases the superficial veins over it are much enlarged; and it has been known to present pulsation. Symptoms may arise from pressure of the tumor on surrounding structures. The detection of cancer-cells in the urine has been considered important, but several excellent observers doubt the possibility of recognizing them. Marked emaciation and debility, with signs of the cancerous cachexia are frequently observed; and there may be evidence of cancer in other parts. The course of the disease is very rapid in children, but comparatively chronic in adults.

Of the *non-malignant* growths very exceptionally found in the kidneys may be mentioned osseous; fibrous or fibro-fatty; enchondromatous; lymphatic or glandular; and syphilitic gummata. Some of these may form an evident tumor.

II. TUBERCLE.

There are three classes of cases in which tubercle is found in connection with the renal apparatus, viz.: 1. As a part of acute miliary tuberculosis, the kidneys being studded with gray granulations. 2. Secondly to tubercular disease in the lungs or other organs, when it does not usually give rise to any local symptoms. 3. As a primary deposit, generally involving the kidneys, their pelves and ureters, the bladder, and sometimes the urethra, being not uncommonly followed in the male by deposits in the prostate gland, testes, or vesiculæ seminales. The last is much the most important group. In the kidneys tubercle is seen at first as gray or yellow nodules in the cortex, which unite, become caseous, and break down, forming irregular abscess-like cavities, which burst into the urinary passages, discharging disintegrated tuberculous matter and pus. Generally both kidneys are implicated, and they are frequently extensively or completely destroyed. In the pelvis and ureters the growth starts in the submucous tissue, where it forms granules, and ultimate inflammation of the overlying membrane is excited, ending often in extensive ulceration and destruction. Occasionally one ureter becomes completely rigid and its canal is blocked up, leading to pyonephrosis.

SYMPTOMS.—During the early period primary renal tuberculosis may be indicated by a dull pain in the region of the kidneys, with frequent micturition. The important symptoms, however, are those of chronic pyelitis or pyonephrosis, and often cystitis as well; great wasting, debility, and hectic fever; and in time implication of the lungs, intestines, or other organs. The urine is almost always deficient; slightly acid; and contains an abundance of pus, frequently a little blood, but not in any large quantity, extra-renal epithelium-cells, much granular detritus, and cases connective-tissue or elastic fibres. If the ureter is

blocked up, a painful fluctuating tumor forms in the corresponding renal region, which may subside with coincident appearance of much pus in the urine should the obstruction be removed. Uræmia is liable to arise if both kidneys are affected.

III. PARASITIC GROWTHS.

1. Occasionally one kidney, especially the left, is the seat of a *hydatid tumor*, which may ultimately attain a great size. It tends to burst into the renal passages, its contents escaping with the urine; very rarely it opens in some other direction; or it may undergo any of the changes to which hydatid cysts are liable.

SYMPTOMS.—There may be none throughout. The most prominent sign of renal hydatid disease is the existence of a tumor, rounded in form, though often somewhat irregular and lobulated; having an elastic or more or less fluctuating feel; and occasionally yielding hydatid-fremitus. As a rule there are no renal symptoms. Should the cyst burst into the urinary passages, important symptoms generally arise, viz., those of one or, more commonly, several intermittent attacks of *nephritic colic*, due to the escape of the vesicles by the ureters; preceded by a sharp pain in the renal region, and occasionally a sense of something having burst; and followed by signs of the passage of the hydatids along the urethra, i. e., great pain to the end of the penis and constant desire to pass urine, with more or less retention; and finally by the appearance of the vesicles or their remains in the urine, frequently along with some blood or pus. Occasionally a cyst blocks up the ureter and leads to hydronephrosis. Inflammatory symptoms arise should the tumor become inflamed; or various symptoms may occur from its bursting in different directions.

2. The *cysticercus cellulosus* has been found in the kidneys.

3. The following entozoa are met with occasionally: *a. Bilharzia hæmatobia*. This worm is found in some other parts, but it is most injurious in connection with the bladder, ureter, and pelvis, being deposited in the minute veins of their mucous membrane. It belongs to the *trematoda*, being about three or four lines long, of soft texture, and bisexual. The morbid effects it may produce are hæmaturia, it being, as previously stated, considered the cause of the endemic hæmaturia of certain hot countries; the formation of raised, injected, and ecchymotic patches in the mucous membrane; local inflammation ending in suppuration; obstruction of the ureters, with consequent hydronephrosis or pyonephrosis; and the formation of calculi, owing to the masses of ova forming a nucleus for urinary deposits. *b. Strongylus gigas*. This is a *nematoid* worm, resembling in general characters the *ascaris lumbricoides*, but being much larger, having a reddish color, and presenting six nodular papillæ about the mouth. It is found in the kidney and urinary passages, and necessarily tends to give rise to considerable dis-

tive sign, however, is the development of a painless, soft, more or less fluctuating renal tumor, which sometimes feels lobulated; unaccompanied by any unusual characters of the urine. Occasionally the obstruction is removed, and the tumor suddenly subsides with copious discharge of urine, which is highly characteristic; the sac may afterwards shrivel up. It may be necessary for diagnosis to use an exploratory trocar or the aspirateur. The tumor may occasion symptoms by pressing on the surrounding structures. It is curious that in double hydronephrosis uræmic symptoms do not arise for a considerable time. Most cases ultimately terminate fatally in various ways. Extremely rarely does the sac rupture spontaneously.

CHAPTER LXII.

URINARY CALCULUS AND GRAVEL.

THE full consideration of this subject comes more appropriately within the scope of surgical works, and here it is only intended to give a brief outline of its main facts. By *gravel* is meant very small concretions, which are often passed in the urine in large numbers.

VARIETIES OF URINARY CALCULI AND THEIR CHARACTERS.—1. *Uric Acid*.—This is very common both in the form of calculi and gravel, being especially associated with the gouty diathesis, and hence occurring mainly in elderly persons and among those of the upper classes. The concretions are formed in very acid, high-colored, concentrated urine. They are hard; heavy; minutely tubercular or smooth on the surface; generally oval and compressed; as a rule small or of moderate size; and variously colored by urinary pigments. There may be several. 2. *Urates*, chiefly consisting of urate of ammonia. These form soft irregular concretions, deposited from acid urine, almost always in the kidneys, and nearly limited to young children. They are soluble in hot water. 3. *Oxalate of lime or Mulberry calculus*.—This is characterized by the surface being rough and tuberculated like a mulberry. It is of moderate size; generally spherical; very hard; and dark brown or almost black. 4. *Phosphatic calculi*.—The important variety is the *fusible calculus*, consisting of mixed calcic and ammonio-magnesian phosphates. It is almost always formed in the bladder, and on a nucleus of some other material. There is no limit to the size which may be attained. The texture is loose and friable, easily breaking down, and presenting a chalky or earthy appearance. Crystals of triple phosphate often stud the surface. By heating with the blowpipe, this calculus fuses into an enamel-like material. Another rare variety is

the *basic phosphate of lime* or *bone-earth calculus*, which is very white, chalky-looking, and soft. Among the exceptional urinary calculi are 5. *Carbonate of lime*. 6. *Cystin*, usually ovate; yellow, but changing to pale green on long exposure to light; lustrous; mammillated on the surface; friable and soft. 7. *Xanthin*. 8. *Fatty or saponaceous concretions*. 9. *Fibrinous and blood concretions*. 10. *Alternating*, consisting of alternate layers of two or more primary deposits.

PATHOLOGY.—Most of the calculi mentioned are of renal origin, being derived from a deposit from the urine as it is first excreted, within the tubules of the kidney, pelvis, or infundibula. Such are termed *primary calculi*, and the theories as to the cause of their formation are: 1. The presence of excess of certain normal ingredients in the urine (uric acid, oxalates, etc.); or of some sparingly soluble abnormal ingredient (cystin, xanthin). 2. Certain conditions of the urine diminishing its solvent power over some of its constituents, as excessive acidity or deficiency of chloride of sodium and alkaline phosphates diminishing the solubility of uric acid and urates; alkalinity from fixed alkali leading to a deposit of bone-earth phosphate or carbonate of lime. 3. The presence of some body suitable to form a nucleus for deposits. The *mixed phosphatic calculus* is almost always formed in the bladder, and results from decomposition of the urine, which becomes ammoniacal; this condition being, as already explained, favorable for the deposition of earthy phosphates, which are often mixed with a little urate of ammonia and carbonate of lime. Hence it is described as a *secondary calculus*, and the deposit always takes place on some nucleus, this being generally a calculus which has passed into the bladder. If the urine is retained in the renal pelvis and becomes ammoniacal, a phosphatic calculus may form there. In structure a urinary calculus usually consists of a *central nucleus*, surrounded by the *body*, and outside all there may be a phosphatic *crust*. The nucleus may or may not be of the same composition as the rest of the calculus; or sometimes it consists of some foreign body, or of mucus or blood. A section generally shows a stratified arrangement, but it may be partly or entirely radiated. Blended into the structure of calculi there is always a little organic matter, including mucus, epithelium, blood, pus, or pigment. The morbid effects liable to be excited by renal calculus are—1. *Hæmorrhage*, from direct injury to some part of the urinary apparatus. 2. *Renal congestion, or inflammation ending in abscess*. 3. *Pyelitis or pyonephrosis*. 4. *Hydronephrosis and renal atrophy* as the result of impaction in the ureter. 5. *Cystitis*. Occasionally calculi become lodged in cysts or pouches, and give rise to no further mischief. It sometimes happens that one ureter is already occluded, and a stone lodges in the pervious one, leading to complete suppression of urine with uræmia. Very rarely a stone makes its way

out of the renal apparatus into other parts, such as the peritoneum or intestines.

SYMPTOMS.—The clinical signs of urinary calculus are chiefly the consequences of the effects above mentioned, and need not be described here. It is only requisite to point out what symptoms are suggestive of a stone lodged in the kidney or its pelvis; and to describe those characteristic of its passage along the ureter to the bladder.

The symptoms of *calculus in the kidney* are pain over the renal region, of a dull aching character, also frequently shooting towards the testes and thighs; pain at the end of the penis; frequent micturition; and the presence in the urine of blood, pus, epithelium from the pelvis and infundibulum, or unorganized sediments, such as uric acid or oxalates. These phenomena are usually aggravated by anything which disturbs the position of the calculus, especially violent exercise or jolting, after which the symptoms often assume the characters of *nephritic colic*, this in its typical form being due to the passage of a calculus along the ureter to the bladder. It is characterized by sudden excruciating pain in one renal region, shooting in various directions, but especially towards the hypogastrium, testis, end of the penis, and inside of the thigh; great restlessness, the patient tossing about in all directions trying to obtain relief; constant desire to micturate, the urine, however, being very scanty or suppressed, what is passed being high-colored, often bloody, and discharged in drops with much burning pain; retraction of the testicles; collapse and faintness, with cold clammy sweats, and a very feeble pulse; generally distressing nausea and vomiting; great anxiety; and sometimes spasm of the muscles or general convulsions. The attack lasts a variable time, there being commonly temporary remissions, and if the calculus reaches the bladder, the symptoms usually subside with equal suddenness, affording a sense of intense relief, and the patient may be conscious of something having fallen into the bladder. If the attack lasts for some time, more or less pyrexia is liable to be set up.

CHAPTER LXIII.

CYSTITIS—VESICAL CATARRH.

DISEASES of the bladder are mainly surgical, but it is necessary to allude to cystitis, as this complaint is not uncommon in medical practice.

ETIOLOGY.—The causes of vesical catarrh are: 1. Direct irritation, especially by calculi and morbid growths; or from certain conditions of the urine, as after taking excess of cantharides, copaiba, beer or spirits,

but particularly when it becomes ammoniacal as the result of retention from some impediment to its escape, or from paralysis in spinal disease. 2. Extension of inflammation in the vicinity, especially that of gonorrhœa. 3. Exposure to cold or wet. 4. Acute exanthemata occasionally.

ANATOMICAL CHARACTERS.—Acute cystitis is characterized by redness, swelling, and softening of the mucous membrane; with formation of excess of mucus and detachment of epithelium with numerous young cells. In the chronic form the color becomes often dirty gray or brown; and there is thickening of the tissues, with, in time, hypertrophy of the muscular coat, the walls becoming much thicker and tough. Abundant muco-purulent or purulent matter forms in the bladder, and the surface may ulcerate or even become gangrenous, or suppuration between the coats may take place, ending in extensive destruction and structural changes. The urine is generally decomposed and ammoniacal. This has been supposed to be the result in some cases of an alkaline fermentation set up by the mucus formed in the bladder. Niemeyer and others, however, have advanced the opinion that this decomposition is generally the consequence of the repeated use of dirty catheters, by which low vital organisms are introduced into the bladder.

SYMPTOMS.—The prominent symptoms of acute cystitis are uneasiness and a sense of heat over the bladder, in the perineum, and along the urethra; in some cases tenderness in the hypogastrium; constant inclination to micturate, a few drops of urine being passed, causing great pain and a sense of burning; and the presence of more or less mucus in the urine. There may be some pyrexia. The chief indication of chronic cystitis is derived from the character of the urine, which contains much mucus and epithelium or pus, or sometimes blood, and if the urine is ammoniacal the pus is converted into a gelatinous, ropy, adhesive substance, which is poured with difficulty from one vessel into another, and may be drawn out into strings. After awhile there is often much constitutional disturbance, with a tendency to hectic fever; and if extensive suppuration or gangrene should be set up, low typhoid symptoms are liable to arise, or those indicative of peritonitis.

CHAPTER LXIV.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF URINARY AFFECTIONS.

I. DIAGNOSIS.

THE diagnosis of urinary diseases is founded on the history, as revealing some of the causes of these complaints; the symptoms present

referable to the urinary organs, and their nature; the results of physical examination, especially as regards the characters of the urine; the presence of remote symptoms due to the renal disorder, particularly dropsy and uræmic phenomena; and the general or constitutional state. The cases may be arranged under certain groups.

1. ACUTE RENAL INFLAMMATORY AFFECTIONS.—These include *acute Bright's disease*; *suppurative nephritis*; *pyelitis*; and *perinephritis*. In all there is generally much pain referred to the kidneys, with functional disturbance of these organs, and pyrexia, but they may generally be distinguished by the circumstances under which each occurs; the characters of the urine; and, as regards Bright's disease, by the dropsy and other characteristic symptoms which accompany it. In pyelitis the presence in the urine of epithelium from the pelvis and infundibula is highly important, while later on pus appears. Suppurative nephritis may give rise to physical signs of an abscess in the renal region. Perinephritis is, as a rule but not invariably, distinguished by the absence of any morbid characters of the urine. Active congestion might possibly be mistaken at first for some of the inflammatory affections, but the milder character of the symptoms and their speedy subsidence sufficiently characterize this condition. Acute cystitis sometimes simulates renal inflammation.

2. CHRONIC BRIGHT'S DISEASE.—The varieties of *chronic Bright's disease* constitute an important group of renal affections. The existence of one or other form of this disease is often quite evident from the history and existing symptoms, especially the characters of the urine. Albuminuria may be the only sign, and therefore it is most desirable to adopt a routine practice of examining the urine, especially if an individual is persistently out of health without any obvious cause, or suffers habitually from dyspeptic symptoms or headache. Of course it must be remembered that albuminuria may be due to other causes besides renal disease, especially cardiac obstruction or admixture of albuminous fluids. Careful microscopic examination is necessary, in order to detect casts if present. The ophthalmoscope is highly important in diagnosis in some cases, and its employment has not unfrequently been the means of revealing Bright's disease where it was previously unsuspected.

The diagnosis between the different varieties of chronic Bright's disease is founded on the conditions under which they arise; and their special symptoms, which have already been pointed out. The stage of degeneration of the kidneys may often be determined with much accuracy by a careful observation of the microscopic elements. Acute Bright's disease may occur as an exacerbation of the chronic form, and it is very important to determine whether such is the case or not by a consideration of the previous history, the presence or absence of any evident cause of the acute attack, and the characters of the urine; if

much blood and renal epithelium should be discharged, and if the microscopic elements do not show signs of degenerative changes, the disease is probably recent and acute. The development of an acute inflammatory affection or of uræmic symptoms in the course of chronic Bright's disease not previously known to exist may prove very puzzling. The rule of always examining the urine will generally lead to the detection of the renal affection.

3. HÆMATURIA—PYURIA.—In certain urinary affections the prominent symptom is the discharge of *blood* or *pus* in the urine. Some of the points to be noticed in making out the source and pathological cause of these admixtures have already been considered, but in addition the following are important, viz.: The history and previous symptoms as revealing some cause, such as calculus or stricture; the seat of local symptoms, whether pointing to the kidney, bladder, or urethra; the characters of the urine, with the amount of the abnormal ingredient, its mode of admixture and exact appearances, the manner in which it is discharged, and the other microscopic elements with which it is mixed; the results of thorough physical examination; and the general symptoms present. With regard to pyuria, one of the chief difficulties is to determine whether it results from pyelitis or chronic inflammation of the bladder and lower passages, especially when these conditions are associated. The presence of epithelium from the pelvis and infundibula is very important at an early period in revealing pyelitis, but it disappears in time; if the complaint exists alone, however, the local symptoms and discharge of acid urine, containing much pus, especially if with a history of some obvious cause, are sufficiently distinctive. When pus comes from the bladder, it is frequently ropy and tenacious, on account of ammoniacal urine being discharged mainly towards the end of the act of micturition. When disease of the lower passages and bladder has been in existence for a length of time, it is highly probable that the kidneys are also involved. When pus originates in urethral inflammation, there are the local signs of this condition, while pus escapes before the urine, and can be pressed out independently. In doubtful cases of leucorrhœa it has been recommended to pass a catheter, and thus remove some of the urine directly from the bladder for examination.

4. RENAL TUMOR.—Occasionally the chief matter in diagnosis is to determine the nature of a tumor in the renal region. This may be due to renal abscess; pyonephrosis; hydronephrosis; cancer or a non-malignant growth; hydatid disease; cystic degeneration of the kidney; or perinephritis. The distinctive features of these have been sufficiently pointed out in their description, the characters of the enlargement and of the urine being important elements in diagnosis. It may be requisite to employ an exploratory trocar or the aspirateur. The tumor may be large as to fill the abdomen, so that it becomes impossible,

except by the history to recognize its origin; and when due to accumulation of fluid it may simulate ascites. A renal tumor may be mistaken for one in connection with the ovary, uterus, suprarenal capsule, liver, spleen, or neighboring glands; or for an accumulation in the intestines.

5. LUMBAR PAIN.—Pain is often referred to the renal region, but this is commonly due to myalgia, neuralgia, accumulations in the colon, or other causes. Should there be reason to suspect a renal calculus, careful and repeated examination of the urine must be made, particularly for uric acid and oxalates; epithelium from the urinary passages; or traces of blood or pus; and it may be well to do this after the patient has taken some severe exercise. As a rule nephritic colic is easy to diagnose, but the same symptoms may result from the transit of a blood-clot or hydatid vesicle. An attack may also be simulated by the passage of a gallstone; severe neuralgia; or intestinal colic.

II. PROGNOSIS.

Any organic disease of the kidneys is serious, especially if it is extensive and if both organs are involved. Of the acute affections, Bright's disease demands the first consideration. A large number of patients affected with this complaint recover completely, but it tends to lapse into the chronic state, and therefore it is necessary to watch the urine carefully for some time before giving a final prognosis. If, along with the subsidence of the symptoms, the albumen and other abnormal urinary ingredients steadily diminish, and the urine is gradually restored to its normal characters and composition, the prognosis is favorable. Even should slight albuminuria hold on for some time, accompanied with a few casts, the case may end in ultimate recovery. If albumen continues to be discharged in abundance for a length of time, the prognosis becomes more serious; much will depend also on the presence and characters of the casts, whether these show that the disease is subsiding, or that it is becoming confirmed, with degenerative changes in and destruction of the epithelium. Recovery cannot be considered satisfactory until every trace of albumen has disappeared. The immediate prognosis is more grave if the urine becomes very scanty and contains a large quantity of albumen, blood, and casts. The chief signs of immediate danger are uræmic symptoms; œdema of the glottis and lungs, or abundant pleuritic or pericardial effusions; severe erysipelas affecting dropsical parts; and the development of acute inflammatory complications.

Suppurative inflammatory diseases in connection with the kidney are very dangerous, on account of the interference with the urinary secretion; the constitutional disturbance; and the dangers of rupture of any purulent accumulation. Pyelitis differs much in its gravity according to its duration; its cause; and whether it is single or double. When confirmed this complaint is always serious, but even after complete

destruction of the kidney recovery may follow if only one organ is involved. Calculous pyelitis is much more favorable than that which follows chronic disease in the lower passages, or that which is excited by tubercle or cancer.

The prognosis in chronic Bright's disease, while always more or less unfavorable, differs much in different cases. The termination is most rapid in the large white kidney, but much will depend on the exact nature and extent of the changes in the kidneys, as revealed by the urine. Patients suffering from this affection may live for many years, and even enjoy comparatively good health. The circumstances which render the prognosis more unfavorable are a long duration of the disease; steady diminution in the quantity of the urine, without corresponding increase in density; excessive albuminuria, with abundant granular and fatty casts or oil-globules; extensive dropsy, with serous effusions; obstinate dryness of the skin; marked cardiac hypertrophy and vascular changes; persistent dyspepsia or disturbances of the bowels; and constant pyrexia. It is wonderful, however, how much improvement in symptoms may be brought about in some apparently hopeless cases. There is always a danger at any moment of the supervention of uræmia; acute exacerbations of the kidney disease; or inflammatory complications, the last being very easily set up and being much more grave than in healthy persons. Patients suffering from Bright's disease are extremely unfavorable subjects for injuries or operations.

It is unnecessary to allude particularly to the prognosis of the rarer forms of renal disease. With regard to calculus, there are a good many dangers attending it; it may produce extensive disorganization of the kidney, or its passage to the bladder may prove fatal. If the stone is very large, or if there are several, the prognosis is more grave. Calculus is a disease liable to recur.

III. TREATMENT.

1. ACUTE INFLAMMATORY AFFECTIONS.—The general measures applicable at the outset in all forms of acute renal inflammation are to keep the patient in bed, completely at rest; to cup over the loins to the extent of from six to ten or twelve ounces, if the case is favorable, or otherwise to dry cup freely; to apply hot poultices or fomentations constantly across this region; to give low diet, with abundance of diluent drinks; and to act freely upon the bowels. In suppurative nephritis, should there be signs of an abscess, this should be encouraged to the surface, and opened when the proper time arrives. At this time abundant support with stimulants may be required, especially if typhoid symptoms should set in. In pyelitis it is very important to remove the cause, if possible; and when the complaint is due to a calculus, a considerable amount of opium or subcutaneous injection of morphia is often needed in order to relieve the pain.

The treatment of acute Bright's disease calls for special consideration. Removal of blood requires particular caution in this affection, on account of the tendency to anæmia, and it should be omitted if the patient is weak, and especially if chronic renal disease has previously existed. The most important object in treatment is to endeavor to get the skin to act freely and persistently. This is best effected by making the patient wear flannel; lie between blankets, avoiding every source of draught; and make use of warm, hot-air, or vapor baths, repeated daily or less frequently, as circumstances indicate. Dr. W. Roberts recommends the warm "blanket-bath." Internally full doses of citrate or acetate of potash or liquor ammoniæ acetatis may be given, freely diluted, with a few minims of tincture of henbane; some authorities highly recommend small doses of tartar emetic or antimonial wine. There is much difference of opinion as to the use of diuretics. Experience has proved that some of these may often be given with great benefit. In the first place the patient should drink water freely, for the purpose of eliminating and washing away the urinary solids and other materials accumulating in the kidneys. All stimulants must be forbidden in the acute stage. In addition to the vegetable salts of potash already mentioned, cream of tartar, digitalis, and infusion of fresh broom-tops have been beneficially employed in combating the dropsy. The bowels may be acted upon by means of a dose of compound jalap powder every morning or on alternate mornings, which may be combined with cream of tartar. Later on podophyllin or elaterium may be required if the dropsy does not subside.

Various symptoms frequently call for attention during the course of acute Bright's disease, especially vomiting and uræmic phenomena. The management of inflammatory complications, particularly those within the chest, is often a matter of much difficulty. Lowering treatment is decidedly not admissible, and on no account must mercury be given, as in renal diseases the smallest dose is liable to produce most serious salivation. Blistering and application of turpentine require great care, as they tend to irritate the kidneys. Opium must also be avoided or only given very cautiously. Free dry cupping, sinapisms, warm fomentations or poultices, and chloroform epithems are the best local applications.

After the more acute symptoms have subsided, the diaphoretic, diuretic, and purgative remedies must be moderated, and at this time the most valuable medicine is iron. Care is needed in commencing with this drug, which should be given at first in a mild form and in small doses, its effects being carefully watched. The tincture of the sesquichloride, syrup of phosphate, ammonio-citrate, or ferrum redactum are the best preparations, and if the first is tolerated in full doses, excellent results are frequently brought about. Quinine may be combined with the iron, and this remedy is particularly recommended after scarlatina.

The diet should be gradually improved, being made nutritious and digestible, and during convalescence a little wine may be given, provided it agrees. The greatest care is necessary at this time to guard against a relapse. The patient should always wear flannel all over the body, and avoid every possible exposure; indeed it is often advisable to enforce confinement to the bedroom until the albumen has quite disappeared, and for some time special precautions are needed. Afterwards a change of air to a warm region and one that is well protected is very beneficial; or this may be recommended if the disease tends to become chronic.

2. CHRONIC BRIGHT'S DISEASE.—This complaint requires very careful and varied management, and it is difficult to indicate any definite line of treatment applicable to all its forms. Still there are certain principles to be followed which will now be pointed out.

a. It is very important to find out the cause of the disease, and remove this if possible, *e.g.*, abuse of alcohol, constant exposure, or suppuration setting up albuminoid disease. b. Hygienic and dietetic management demands careful and constant attention. In those cases where there is merely albuminuria, this is often all that is needed. The patient must be completely clad in flannel; avoid exposure, especially a chill or wet; and take moderate exercise daily. If possible a residence in a tolerably warm, equable, and sheltered district is advisable, or a temporary change to such a district should be recommended. A sea-voyage is sometimes highly beneficial in cases not far advanced. It is very necessary to keep up a free action of the skin by means of warm and other baths with friction. The diet requires supervision and should be of a nutritious and digestible kind. Milk may be usually taken in large quantities. Skimmed milk has been specially recommended in the treatment of Bright's disease. Strong stimulants are better avoided, but light wines or a glass of good bitter ale often do good. The bowels must be kept well-opened daily, and the digestive functions maintained in good order. c. Treatment directed to the constitutional state and to the condition of the blood is of the highest value. The administration of iron, regularly and perseveringly carried out, often produces the most beneficial results in the way of improving the state of the blood and general system. If it can be taken, the tincture of steel or the solution of pernitrate is the best form, but the saccharated carbonate, ferrum redactum, syrup of iodide or phosphate, ammonio-citrate, or citrate of iron and quinine, are also very useful. Among other constitutional conditions requiring special attention are phthisis; albuminoid disease; gout; and saturnism. d. Some authorities consider it desirable to diminish the amount of albumen discharged, by means of tannic or gallic acid, mineral acids, alum, or iodide of potassium. It is very questionable whether any of these are efficacious for this purpose. e. Dropsy is the chief symptom calling for interfer-

ence in a large proportion of cases of Bright's disease. Purgatives and baths are the important remedies. Among the former jalap, cream of tartar, elaterium, scammony, gamboge, and podophyllin, are the most serviceable. Some give liquor ammoniæ acetatis freely with iron, to act as a diaphoretic; others recommend James's or Dover's powder. Opinions are much divided with regard to diuretics, both as to the propriety of giving them, and as to those which are most efficacious. In my experience certainly they are not of much use as a rule, and they may do considerable harm. In extreme dropsy puncture or incision of the skin of the legs or scrotum may be required. Great care is necessary when carrying out this measure, in order to guard against erysipelas, by applying warm moist flannels, frequently changed and thoroughly cleansed before being reapplied; and by sponging the parts well before each application is made: some practitioners employ antiseptic washes. Particular care is also needed against pressure or irritation by urine. *f.* Among other symptoms which are likely to require treatment are those indicative of dyspepsia; vomiting; derangement of the bowels; headache; and uræmic phenomena. The remarks made under acute Bright's disease as to inflammatory complications apply also to the chronic affections. *g.* It is necessary to warn patients against the dangers to which they are exposed, and impress upon them the necessity of paying strict attention to the hygienic matters already mentioned. Should cardiac hypertrophy be set up, with changes in the vessels, the danger of the occurrence of cerebral hæmorrhage should be borne in mind.

3. PURULENT DISCHARGE IN THE URINE.—Should this symptom require special treatment, the principles are: *a.* To remove any obvious cause of the suppuration, if possible. *b.* To administer remedies to check the formation of pus, the chief being alum; astringent preparations of iron; mineral acids; tannic or gallic acid; vegetable astringents, particularly decoction of uva ursi or buchu; metallic astringents in obstinate cases; balsams and resins, especially balsam copaibæ and turpentine. If the bladder is affected, injections of warm water are useful, or even astringent injections carefully employed. *c.* To support the general health and treat the constitutional state by good diet, change of air, sea-bathing, tonics, and cod-liver oil.

4. Some conditions of the kidney occasionally need *operative interference*. In cases of pyonephrosis or abscess of the kidney it may be requisite to let out the pus. In hydronephrosis the first principle is to endeavor to remove the obstruction which causes the retention of urine, and frequent manipulation and shampooing over the renal region has sometimes been found effectual for this purpose. If this does not succeed, and there are indications of danger, tapping must be resorted to and repeated if necessary. Hydatid tumor must be treated in the manner described in connection with hydatid of the liver. The removal of

the kidney for cancer or other solid tumor is scarcely permissible, but has been performed.

5. The treatment of *urinary calculus* is very important. In the first place measures should be taken to prevent its formation, if the urine gives indications that there is any danger of this; or if there has been a previous history of stone. The chief general measures requisite for this purpose are to make the patient drink water freely, so as to maintain the urine in a diluted state; not to allow too long intervals between meals, but to take four or five light meals during the day; and not to lie too much in the recumbent posture, the hours of sleep being moderate. Uric acid calculus is further guarded against by strict regulation of diet, which must be mainly farinaceous, all heavy meals with much meat and rich wines being avoided; and by administering moderate quantities of bicarbonate or citrate of potash. Oxalate of lime calculus is prevented by keeping the urine very dilute; maintaining the activity of the skin; avoiding certain vegetables rich in oxalates, especially rhubarb and sorrel, and also calcareous waters; and giving alkaline carbonates. Phosphatic calculus is obviated by careful attention to the bladder, if this organ is diseased; and by endeavoring to change the character of the urine; if it is ammoniacal, it may be desirable to wash out the bladder with dilute acids. It has been thought possible to dissolve calculi after their formation—those of uric acid in the kidneys by administering acetate or citrate of potash freely in frequently repeated doses; phosphate calculi by dilute acid injections into the bladder. For nephritic colic the remedies are free administration of opium by the mouth or rectum, or subcutaneous injection of morphia; belladonna, if opium is not admissible; warm baths, with fomentations or poultices over the loins; and the abundant use of warm demulcent drinks. It may be necessary to cup over the loins. Change of posture and manipulation along the ureter have been said to aid in the passage of a calculus. If the pain is extreme, it may be desirable to administer chloroform. Vomiting and collapse must be attended to. Surgical treatment is of course usually required when a stone reaches the bladder; and in rare instances it has been found necessary to remove a large calculus by operation from the pelvis of the kidney, but only if it has led to the formation of an abscess. The treatment of the pathological conditions induced by some have already been sufficiently considered.

CHAPTER LXV.

DISEASES OF THE ABSORBENT GLANDS.

CLINICAL CHARACTERS.—The signs to be sought after as indicating morbid conditions of the absorbent glands are: 1. Pain and tenderness in these structures.

often with a feeling of stiffness. 2. Enlargement, generally accompanied with changes in consistence. This may be limited, or affect the glands extensively throughout the body, not uncommonly giving rise to considerable tumors. The superficial glands are either distinct; or tend to form nodular, irregular, firm masses, owing to a number of glands being aggregated together; or chains of these may be involved. Those of the neck, axilla, and groin are most commonly affected. In the chest they may give rise to the physical signs of mediastinal tumor. They can frequently be felt in the abdomen by making steady deep pressure or grasping portions of the walls, either as separate nodules or as a distinct tumor. The latter is deeply situated, nodular, and fixed, being usually not very large. 3. Interference with the passage of lymph and chyle.—It has been supposed that obstruction to the passage of lymph may lead to its coagulation and to a kind of solid œdema. Interference with the progress of the chyle will gravely affect the nutrition of the body, and thus induce emaciation. 4. Evidences of pressure upon, irritation, or destruction of neighboring structures. These will of course vary with the situation of the enlarged glands. Neuralgic pains and localized œdema are not unfrequently observed, owing to nerves and veins being interfered with. In the chest and abdomen more or less pressure signs may be present, as in the case of other tumors. By their irritation inflammation of serous membranes and other structures may also be excited. The glands are liable to undergo destructive changes, which may implicate neighboring parts, causing serious mischief. For instance, they may suppurate and destroy the cutaneous structures; or in the chest lead to destruction of portions of the lungs or perforation of air-tubes or vessels; in the abdomen to perforative peritonitis or perforation of the bowels. 5. Symptoms indicating some constitutional cachexia. These are of much importance, necessarily differing in their character according to the nature of the disease.

SPECIAL DISEASES.

1. ACUTE CONGESTION AND INFLAMMATION—ADENITIS.—The absorbent glands are very liable to become the seat of active congestion or acute inflammation, especially from some neighboring irritation conveyed along the absorbent vessels; certain infective poisons, *e. g.*, syphilitic virus; or injury and straining. This may subside or proceed to suppuration, or leave the glands chronically enlarged, especially if the irritation is repeated several times. The early symptoms are pain, tenderness, stiffness, and swelling of the affected glands; which may be followed by signs of the formation of an abscess. There is frequently some pyrexia. Chronic inflammation is set up in some cases, the glands becoming gradually enlarged and hardened; they may subsequently degenerate and become caseous or form abscesses.

2. SIMPLE HYPERTROPHY OR LYMPHADENOMA.—This is a very important morbid condition of the glands. As already stated, it occurs in one form of leucocythæmia, and it is the prominent anatomical character of what is known as *Hodgkin's disease*, which is presumed to be a constitutional affection, essentially characterized by hyperplasia of the absorbent glands more or less throughout the body; followed by increase of the lymphatic tissues in the spleen, liver, lungs, and various other structures. The glands often form considerable tumors, superficial or contained within internal cavities, of somewhat soft consistence.

Microscopic examination shows that the enlargement is entirely due to hypertrophy of the gland tissue. Clinically, in addition to the symptoms associated with the enlarged glands, which are generally painless, there are usually signs of profound constitutional disturbance, which may precede the glandular hypertrophy, characterized by extreme anemia, with its accompanying symptoms, and often an appearance of serious illness; marked muscular weakness, the patient frequently tottering and trembling; feeble circulation; and great emaciation. Edema of the legs is common. There is no increase of white corpuscles in the blood. The course of the disease may be acute, attended with considerable fever and profuse perspirations, vomiting and purging, and mental wandering at times. On the other hand, the glands of the neck, axilla, and other parts may be extensively hypertrophied, and yet the system not be much affected, the patients enjoying very fair health.

3. SCROFULOUS OR TUBERCULAR DISEASE.—In scrofulous subjects, especially children, one of the prominent characters in many cases is chronic enlargement of the external glands, especially those of the neck, there being a subsequent tendency to degeneration and breaking down of their structure, with unhealthy suppuration. In other cases the glands within the abdomen and chest are extensively affected. The enlargement was formerly considered as being due to an unhealthy chronic inflammation; or to a deposit of tubercle. Now, however, it is known to be the result of hyperplasia of the lymphatic elements. These have a very low vitality and are liable to become speedily disorganized and caseous; they may finally dry up and calcify, or go on to unhealthy suppuration and burst or destroy neighboring tissues. When the affected glands are superficial they are easily recognized. In the chest they constitute the disease named *bronchial phthisis*, and in addition to giving rise to the signs of a mediastinal tumor, the glands are liable to soften and form excavations, ultimately involving the lungs, or opening into the trachea or a bronchus, the pleura, or a great vessel. If they communicate with the air-passages, there is much expectoration of muco-purulent or purulent matter; as well as often of blood, caseous matter, and calcareous particles. When the mesenteric glands are implicated—*tabes mesenterica*—they may be felt separately or as a mass, and often give rise to symptoms of peritoneal irritation or inflammation; flatulence; colicky pains; and various digestive disturbances. Owing to the flatus the abdomen is generally much distended. Appetite may be excessive, deficient or lost, or capricious. The bowels are frequently irregular, either constipated or relaxed, the stools being unhealthy. In exceptional instances the softened glands have ruptured into the peritoneum or intestines. In this variety of gland disease there is usually considerable constitutional disorder, indicated by emaciation, debility, and fever tending towards a hectic type. The loss of flesh is

frequently extreme when the lacteal glands are involved ; and it is also very marked in bronchial phthisis if the glands break up. In children, in whom this complaint is much the most common, there is in many cases no evidence of tubercle in other organs ; but in adults the lungs or other structures are generally implicated. Recovery may be brought about even when the glands throughout the body have been extensively affected, many of them perhaps remaining as calcified masses.

4. **LARDACEOUS DISEASE.**—The glands are often the seat of albuminoid infiltration. They are then very firm and small, on section presenting the characteristic pale, homogeneous, waxy appearance. In the abdomen they can be felt as little hard masses, separate, and readily movable. The constitutional symptoms are those of the general disease.

5. **CANCER.**—As a secondary deposit cancer is very liable to implicate the absorbent glands in the neighborhood of any structures affected with this disease. It may commence in them primarily. All forms are met with, and large, hard, nodulated tumors are often formed. The clinical phenomena are mainly those due to the tumor, with evidences of the cancerous cachexia. The glands are generally very painful and tender.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

I. **DIAGNOSIS.**—In forming a diagnosis of glandular diseases, special attention must be paid to the constitutional condition, and to the physical characters presented by the glands. The main difficulty lies in determining disease of the glands in internal cavities, and in making out their exact condition. Glandular disease must be always borne in mind as a prominent cause of wasting in children, especially affections of the mesenteric and bronchial glands.

II. **PROGNOSIS.**—This will depend on the nature and cause of the disease ; the state of the constitution ; the situation and extent of the glands affected ; and the changes which they undergo. In internal cavities enlarged glands by their mere pressure or destructive effects are liable to give rise to serious mischief. Extensive glandular disease in children, particularly when the mesenteric glands are involved, is very dangerous.

III. **TREATMENT.**—1. In acute adenitis the principles of treatment are to remove the cause, keep the affected part at rest, and use warm fomentations and poultices freely. Should suppuration be set up, this must be managed on the usual principles. 2. In chronic affections constitutional treatment is of the first importance. This must depend on the nature of the disease, but the remedies generally serviceable are good nutritious diet, with plenty of milk ; attention to all hygienic matters, with change of air, especially to the seaside, sea-bathing being

often very beneficial; regulation of the digestive functions; cod-liver oil, quinine, iron in some form, especially syrup of the iodide or phosphate, and other tonics. Iodide of potassium and liquor potassæ have been supposed to influence the size of the glands. It is the custom to use various applications over enlarged glands with the view of diminishing their size, especially ointments of iodine or iodide of lead; tincture of iodine painted over the skin; lotions of iodine and iodide of potassium; spirit lotions or those of muriate of ammonia; or sea-weed poultices or fomentations. In many instances undoubtedly much good may thus be effected, but certainly it is necessary to be careful in employing strong applications, such as iodine; and in practicing violent friction, as injurious irritation and inflammation may be thus induced. Gentle friction with some simple oleaginous substance is frequently beneficial. Should abscesses form, they must be treated by poulticing and incisions. Symptoms due to enlarged glands in internal cavities must be treated as they arise. Some practitioners recommend irritant injections into the substance of chronically enlarged glands. Extirpation has been occasionally practiced, but this is not a desirable mode of treatment. The administration of phosphorus may diminish the size of the glands in Hodgkin's disease, but is for other reasons not to be recommended.

CHAPTER LXVI.

DISEASES OF THE THYROID GLAND—BRONCHOCELE—GOITRE.

THE cases of disease affecting the thyroid body which come under the notice of the physician belong to two distinct groups, which it will be necessary to notice separately.

1. In certain districts enlargement of the thyroid gland, *bronchocele* or *goitre*, is very prevalent, so as to become an endemic disease. It is particularly observed at the base of high mountains. In this country goitre prevails especially in Derbyshire, hence named "Derbyshire neck;" and in certain parts of Yorkshire, Sussex, Hants, and Nottinghamshire. It has been attributed to various meteorological and other causes, but the mass of evidence goes to prove distinctly that it is due to impregnation of the drinking-water with excess of lime and magnesia salts, these having been dissolved in the percolation of the water through the geological strata containing them. The disease is observed most commonly in females, and is rare before puberty, though it has been known to be congenital.

ANATOMICAL CHARACTERS.—The degree of enlargement varies con-

siderably, and the gland may attain very great dimensions. It begins in the isthmus or in one lobe, especially the right, but ultimately usually involves the entire organ. The shape is generally altered, the distinction of the several parts of the gland being lost, but not always. At first the tumor is soft, but gradually becomes firmer, and may ultimately be exceedingly hard. In the early stage there is simply hypertrophy of the gland, *simple bronchocele*, with formation of a glutinous, ropy, colloid fluid in its cells; afterwards the bloodvessels increase in number and become dilated, while numerous cysts form, *cystic bronchocele*, containing the gelatinous material or a bloody-looking fluid. Ultimately calcareous matter is deposited, and the gland may be converted into a calcified capsule, inclosing cysts, various kinds of fluid, calcareous aggregations, etc. Inflammation and suppuration or ulceration are liable to arise, altering materially the characters of the enlargement.

SYMPTOMS.—The thyroid gland presents an obvious swelling. It may compress the neighboring structures, and lead to serious dyspnœa, dysphagia, or interference with the circulation in the neck. The general system is below par, there being often much debility and anæmia. In some valley districts bronchocele is associated with *cretinism*, a condition indicated by marked mental deficiency, with atrophy of the brain; as well as bodily deformity.

2. *Exophthalmic Goitre—Graves's or Basedow's Disease.*—This is a highly interesting complaint, characterized by palpitation of the heart; marked pulsation in the vessels of the neck and head; enlargement and usually pulsation of the thyroid gland; and prominence of the eyeballs or exophthalmos. It is observed by far most commonly in young women, but may be met with in males, who are usually somewhat advanced in age. Almost always, but not invariably, the condition is associated in females with marked anæmia and menstrual derangement. Pathologically it is believed to be the result of paralysis of the vaso-motor nerves of the vessels of the heart, thyroid, and head and neck. The enlargement of the thyroid, which is not usually very great, is due to dilatation of its vessels; serous infiltration of the tissues; and hypertrophy; very rarely do cysts form. The exophthalmos results from the eyes being pushed forward, owing to increased vascularity, œdema, and probably hyperplasia of the fat behind them. There is no evidence in support of the notion that the nervous disturbance is due to any obvious change in the cervical ganglia of the sympathetic, as has been suggested.

SYMPTOMS.—As a rule the subjects of this affection are very anæmic or chlorotic. Palpitation has usually been noticed for some time before the other phenomena, and these generally come on very gradually. The enlarged thyroid pulsates or presents a peculiar thrilly sensation, and frequently a hæmic murmur is heard over it. The pulsation may be visible at a distance, and the carotids are often seen to throb violently. The degree of exophthalmos may become so great that the eye-

balls project considerably, so that the eyelids cannot cover them; hence grave destructive changes are liable to be set up in these organs. Their movements also may be much impaired. The *exophthalmos* is sometimes preceded by a spasmodic contraction of the *levator palpebrarum*, said to be very characteristic. Uncomfortable sensations of throbbing, giddiness, and headache are often complained of. Many cases improve or recover under proper treatment. Death may result from the consequences of gradual dilatation and weakening of the heart.

TREATMENT.—In simple *bronchocele* the principles of treatment are to change the residence; avoid drinking the impregnated water; employ iodine both internally and externally; and improve the condition of the system by means of iron. Iodine has gained the reputation of being almost a specific, and the best mode of administration is to give the tincture in small doses with iodide of potassium freely diluted. Iodide of iron is also very useful. Externally applications of the tincture, iodine ointment, or ointment of iodide of mercury are chiefly employed. Pressure may be beneficial. If this treatment is unsuccessful, surgical interference is advocated, especially injection of the gland with some irritant, such as diluted iodine or tincture of steel; passage of a seton or wire through the tumor; ligature of the thyroid arteries; or finally extirpation of the enlarged organ.

For *exophthalmic goitre* the treatment is that of the general state, iron and other tonics, with nutritious digestible food, and careful attention to hygienic conditions, being the chief remedies required. *Digitalis* is useful, on account of its influence upon the heart; and *belladonna* has also been found efficacious in combination with iron. *Ergot* has been recommended, as well as galvanism of the sympathetic in the neck. Care must be taken to prevent the eyes from becoming injured, and with this object the eyelids may be closed by means of a light bandage if necessary.

CHAPTER LXVII.

DISEASES OF THE NERVOUS SYSTEM.

CLINICAL CHARACTERS.—The clinical investigation of nervous affections is frequently very difficult, and there is no class of diseases in which a definite and systematic mode of examination is more requisite. Further, it is highly important to remember the anatomy and physiology of the nervous system, particularly as to the functions of the different parts of the central organs, and the distribution and functions of the nerves. The clinical phenomena which may be associated with the nervous system are as follows:

1. Morbid sensations in the head, including headache, tenderness, sense of weight or heaviness, throbbing, heat, vertigo or dizziness.

2. Morbid sensations connected with the spine, chiefly pain, tenderness, burning, and a peculiar sense of tightness round the body, as if it were encircled by a tight cord extending from the spine. As regards spinal pain, it is important to notice whether it is felt all along the spine or is localized; if it is constant or paroxysmal; if it shoots in any direction; and in some cases how it is influenced by walking, movements of the spinal column, percussion or kneading along the spine, concussion of the heels, and the passage of ice or of a hot sponge along the spine.

3. *Mental Disturbance*.—It is impossible to indicate here all the possible derangements coming under this head, especially as observed in insanity, but their general character may be gathered from the following summary: *a.* Impaired consciousness, from mere stupor to absolute coma. *b.* Disorder of the intellectual faculties, including perception and apprehension, thought, reasoning, judgment, and memory. Under this would come the various forms of delirium, mental confusion, delusions, illusions, and hallucinations; or there may be mere failure or complete loss of one or all of the mental powers. In some cases they are unnaturally acute. *c.* Alterations in the moral feelings and actions, manner of behavior, disposition, affections, spirits, and temper. *d.* Emotional disorder, as evidenced by the emotions being unduly excited or the reverse. *e.* Disturbance of speech as an intellectual act—*aphasia*. *f.* Disorder of sleep, including somnolence, insomnia, uneasy sleep with bad dreams, somnambulism, and somniloquism.

4. *Subjective Disturbances of the Special Senses*.—*a. Vision*. The chief derangements of vision are photophobia or undue sensibility to light; photopsia or subjective sensations of flashes of light, of iridic colors, sparks, muscæ volitantes or spectra, and defective sight, either dimness of vision to complete blindness, double vision or diplopia, or hemiopia, part of the field of vision being lost. *b. Hearing* may be affected, as shown by intolerance of sound; different degrees of deafness; or tinnitus aurium. *c. Smell or taste* may also be impaired or lost; unduly sensitive; or perverted.

5. *Alterations in General Sensation and Tactile Sensibility*.—These comprehend: *a.* Hyperæsthesia or undue sensibility to touch; and dysæsthesia or hyperalgesia, i. e., undue sensibility to pain. *b.* The opposite condition of hypæsthesia, anæsthesia, or analgesia. There may be a sensation of something intervening between the skin and any object touched; or inability to distinguish the characters of the surface or form of an object. *c.* Various kinds of pain and tenderness felt in different parts of the body. *d.* Paræsthesiæ or perverted sensations, such as numbness, tickling, itching, formication or creeping, heat or cold, pricking, tingling, aura epileptica.

6. *Impairment of the Muscular Sense*.—This deviation probably exists in certain forms of disease, and is evidenced by a difficulty in realizing weight and resistance, or in performing certain muscular acts without looking and paying attention to them; or by a want of consciousness as to whether different muscles are contracted or not.

7. *Alterations affecting Motility*.—These are of the greatest importance, and comprise: *a.* General restlessness and jactitation. *b.* Abnormal attitudes or movements while lying, sitting, standing, or moving, *e. g.* being coiled up; boring the head into the pillow; disposition to stagger or fall, to advance irresistibly or run, rotate on an axis, or proceed in a circle. *c.* Evidences of muscular weakness, in the way of general trembling; local tremors, or unsteadiness of a limb when raised. *d.* Signs of undue muscular irritability, viz., twitchings; subsultus tendinum; rigidity; clonic or tonic spasms; convulsive movements, and cramps or painful spasms. As varieties of symptoms due to spasmodic movements should be mentioned strabismus; rolling about of the eyes; champing of the jaws; grinding of the teeth, and trismus or lockjaw. *e.* Paralysis. This symptom will be presently

considered at length. *f.* Loss of power in co-ordinating muscles for the performance of various acts. *g.* Automatic involuntary movements, such as those observed in chorea. *h.* Deficient or excessive reflex irritability. *i.* Cataleptic fixity of a limb, or slow, purposeless movements of flexion and extension.

8. *Changes in Vascular Supply, Nutrition, and Secretion.*—The influence of the nervous system on these processes is well known, and as illustrations may be mentioned the change in temperature and the wasting, with tendency to bed-sores in paralyzed parts; the disorders of nutrition and secretion accompanying neuralgia; and the influence of nervous affections on the secretion of tears, saliva, or urine.

9. There are some important *extrinsic* symptoms often associated with nervous diseases, viz., those referable to the stomach, bladder, bowels, and sexual organs, many of them being due to paralysis. They include nausea and vomiting; obstinate constipation, accumulation of feces in the rectum, involuntary or unconscious defecation; irritability of the bladder, retention or incontinence of urine, involuntary micturition; diminution or loss of sexual inclination or power, undue sexual excitability, or constant priapism.

10. *Physical Examination.*—Objective modes of examination are highly important in the investigation of nervous diseases, and the following outline may serve to indicate the information to be thus obtained:

A. Examination of the Head as to size, shape, state of the fontanelles, signs of tumors.

B. Examination of the Spinal Column as to shape or evidences of a tumor.

C. Tests of Tactile Sensibility.—In order to determine the state of cutaneous sensibility, the effects must be noted of a slight touch or pressure; of tickling, pinching, or pricking the skin; using Weber's, Sieveking's, Jaccoud's, or other æsthesiometer; and electricity. Weber's instrument consists essentially of a pair of compasses, the points of which are covered with sealing-wax, and it is noted what is the shortest distance apart at which these can be recognized as separate points of touch, an approximate idea being thus gained as to the degree of sensibility of a particular part.

D. Tests applied to Muscles.—When any muscles are supposed to be paralyzed, it is necessary to desire the patient to attempt different actions which would bring the affected muscles into play, and thus observe whether they are really paralyzed, and to what degree; noting whether the actions can be performed at all, or if they are slowly produced and deficient in power. Some employ instruments to test the grasping power. When there is loss of co-ordinating power, the involved muscles should also be tested. A matter of frequent importance is to determine whether muscular irritability is retained or lost, as well as the degree of facility with which it is excited, and the force with which the muscles act when thus irritated. This is accomplished by employing some mechanical irritation, such as pressure, percussion, or drawing the finger along the muscles; but especially by electricity. In many cases it is useful to note the effect of slight irritation of the skin in exciting reflex actions, as, for instance, tickling the soles of the feet in paraplegia.

E. Uses of Electricity.—Electricity has now come to occupy a most prominent position in the diagnosis, prognosis, and treatment of affections of the nervous system. It is, therefore, desirable to give here a brief general summary of the diagnostic aids which it affords. A satisfactory knowledge of the many forms of apparatus employed, and of the modes of using them, can only be obtained from practical demonstration, and it must suffice to state that one of three kinds of electricity is made use of in constructing the different appliances, viz.: 1. *Frictional, static, or Franklinic.* 2. *Galvanic or Voltaic, which may be used as a continuous or interrupted current.* 3. *Magneto-electric or Faradic, the so-called induced current.*

from which only an *interrupted* current can be produced. The diagnostic value of these several forms is indicated in the following remarks:

(1.) In a case of supposed shamming of unconsciousness or a "fit," much light may often be thrown upon its nature by giving the patient a tolerably strong shock, or touching parts of the face with one of the handles. Even where there is real unconsciousness, as in cases of alcoholic poisoning, the degree of this may be made out by noticing the effect of cautiously touching one of the features.

(2.) The most important use of electricity in diagnosis is to test: *a.* The electric irritability or contractility of muscles, *i. e.*, the readiness with which they contract. *b.* The force with which they act. Either faradization or interrupted galvanism may be employed, and for determining the irritability of muscles a very weak current is necessary; for testing the force, a strong one must be used. It commonly happens in paralysis that the irritability of the affected muscles is increased, these being brought into action by a much weaker current than those which are healthy; while, at the same time, the force of contraction is greatly diminished, but little action being excited even by the strongest current. The information to be derived from this application of electricity is twofold: (i.) It may reveal whether a part said to be paralyzed is really in this condition or not, which is especially important in cases of malingering, hysteria, and after railway accidents. For instance, should one side or one limb be stated to be paralyzed, if it is found that in the corresponding muscles irritability is excessive as compared with the healthy side, while the force of contraction under a powerful current is greatly diminished, this gives certain evidence that paralysis exists. No positive conclusion can be arrived at if the irritability and force are normal, for this may be the case in true paralysis. (ii.) Suppose a part to be really paralyzed, electricity will reveal the relation of the muscles to the portion of the nerve-centre from which the nerves which supply them come. If the electric irritability is permanently lost or more or less impaired, it shows either that the part of the nerve-centre from which the nerve originates is itself disorganized; or that the nerve in some part of its course is destroyed completely or partially; or that there is some condition in the muscles themselves, or perhaps in the minute branches of nerve distributed to them, which prevents them from acting under electricity, as is especially the case in paralysis from lead, and in certain local forms resulting from exposure to cold. In paralyzed muscles the electric irritability may be temporarily impaired from mere disuse, but a few applications of the current will then speedily restore it. Should it be normal, this proves that there is no loss of continuity in the nerve supplying the muscles affected, and that the portion of the nerve-centre from which this arises is not destroyed. For instance, if the facial nerve is paralyzed from cerebral disease, which as a rule does not affect its root of origin, the electric irritability of the facial muscles is but rarely impaired; but if the nerve is involved in some part of its course, as from disease of the temporal bone, then the irritability is always weakened or lost. In hemiplegia from cerebral disease, should the irritability of the affected limbs be permanently impaired, it proves that the disease has extended to those portions of the spinal cord from which their nerves actually arise. Again, in paralysis from disease of the spinal cord, if the contractility is normal, this shows that the seat of the disease is higher than the origin of the nerves, and has not extended to this point, and *vice versa*. Dr. Marshall Hall used the term "spinal paralysis," to signify complete separation of a muscle from the spinal cord, whatever condition this may be due to. In certain forms of paralysis, *viz.*, that due to lead or local exposure to cold, as well as in anomalous cases of atrophic paralysis of the limbs, it is found that the electric irritability of the muscles is increased to a slowly-interrupted galvanic current, while it is diminished or extinct to a rapid current and to faradization. By the employment of the slow current improvement

may be brought about, and as this takes place the undue irritability diminishes, while it improves to the rapid current and faradization. Not uncommonly, after sudden paralysis, muscular contractility becomes excessive after a few days; this indicates some irritation in connection with the brain or spinal cord, consequent upon increased vascularity, inflammation, or some other morbid condition.

(3.) Another use of electricity is to test the sensation which it produces in the skin, muscles, nerves, and nerve-centres. Reference need only be made here to the first two. The general cutaneous sensibility to electricity is often increased in hysterical and nervous persons. If it is excessive on one side, it becomes a sign of central irritation. In general shock and some cases of hysteria, trance, and similar conditions, the electric sensibility of the skin is lessened or absent; as well as in some very rare cases of chronic central disease. It is often locally lost or impaired in connection with paralysis of a sensory or mixed nerve. Muscular sensibility is as a rule in proportion to the contractility. Occasionally, however, sensibility is lessened or extinct when contractility is normal, as in some cases of hysteria; and the reverse has been observed in certain instances of lead palsy. Sometimes also there is increased muscular sensibility while contractility is natural, as in myalgia and rare cases of central disease. If contractility, with muscular and cutaneous sensibility, are all impaired in a limb or in one-half of the body, the condition is one of shock or of extensive cerebro-spinal lesion.

F. When a limb is paralyzed, the state of nutrition of the tissues must be noted, especially that of the muscles, by feeling them and by making circular measurements, for which a special apparatus has been invented by Dr. Reynolds; it should also be observed whether there is any local change in temperature, or in the characters of the pulse.

G. Examination directed to the Special Senses.—It may be requisite to test the sense of hearing, taste, or smell, but the most important matter coming under this head is the examination of the eye and of vision. This comprehends: (i.) *Examination of the pupils*, observing whether both are contracted or dilated; if they are equal or unequal; and if they act properly under light. (ii.) *Testing the sight* in various ways, particular attention being paid to the *field of vision* in all directions. (iii.) *Examination with the ophthalmoscope*.—This instrument has now come to occupy a most important position as a mode of investigation of diseases of the nervous system. For a full account of this subject, and of the various kinds of apparatus employed, with the methods of using them, reference must be made to special works. It is, however, by practical demonstration that the use of the ophthalmoscope is best learnt, and considerable personal practice with the instrument is required before it can be satisfactorily employed. In the succeeding remarks a brief description will be given of the morbid appearances which may be presented, the structures to which attention must be directed being the optic disk, blood vessels, retina, and choroid. At the outset it must be remarked that the normal amount of vascularity is subject to great variations, and therefore but little importance should be attached to slight alterations in this respect, unless they are changing or unilateral.

a. Hyperæmia.—This may be limited to the vessels of the disk or retina, or involve both sets. It is characterized by more or less increased redness, with enlargement of the vessels and apparent increase in their number, many radiating from the disk, and some appearing tortuous or varicose, there being in some cases little dark-red spots due to little "kinks" in the vessels. Pulsation in the vessels is often unusually distinct, especially on lightly pressing the eyeballs. Slight oedema of the disk may follow, dimming the edge, and veiling its surface. There may be subjective symptoms of dimness of vision, heaviness about the eyes, flashes of light, or iridic colors. The encephalic conditions with which hyperæmia may be asso-

ciated are congestion, acute or chronic inflammations, especially meningeal, and tumors. It may exist as such; but is more frequently the first stage of an acute inflammation, especially when due to a tumor. *β. Anæmia.*—This condition may be persistent, as in general anæmia; or transitory, as in vascular spasm. As a rule the disk, retina, and choroid are affected. There is pallor, with emptiness and shrinking of the vessels. It may be attended with temporary blindness, flashes of light or *muscæ volitantes*, and general weakness of vision. The local causes are vascular spasm and embolism. Anæmia has been noticed in epilepsy and acute uræmia. *γ. Edema of the disk.*—Most frequently accompanying other conditions, viz., hyperæmia, ischæmia, but especially neuritis; in rare instances œdema exists alone. *δ. Ischæmia of the disk—Choked disk.*—The opening in the sclerotic through which the optic nerve passes is an unyielding ring, and when there is any obstruction in connection with the cavernous sinus, preventing the return of blood by the ophthalmic vein, it is believed that strangulation is brought about at this aperture, which ultimately leads to serious changes in the disk. To this condition the term *ischæmia* is applied, which is described as being due to "obstruction at the cavernous sinus, with concurrent action of the sclerotic ring" (Von Graefe). When advanced, the appearances in ischæmia are those of intense congestion and inflammation, and it must be remarked that some of the best authorities deny that there is any essential difference between ischæmia and neuritis, either in characters or causation, and consider that the chief difference between them is one of degree. The disk is much swollen and prominent, generally rising steeply on one side and sinking gradually on the other, while the margin is obscured by infiltration and excessive vascularity, the latter giving it a mossy look, owing to the great increase in the number of capillaries. The color may be deep red, but is often a mixture of dirty gray and red, from the mixing of exudation with distended capillaries and minute extravasations. The nerve-fibres are somewhat swollen, less transparent than in health, so that the papillary region looks more coarsely fibrous. Cell and nuclear proliferation takes place in the connective tissue between the bundles of nerve-fibres and around the vessels. The retina is only altered immediately around the disk, being opaque, its veins enlarged, with sometimes streaks of exudation along the larger of them. Some nerve-fibres are disintegrated. The trunk of the optic nerve is unaffected. This state frequently exists to a marked degree without any disturbance of central vision. The causes of ischæmia are meningitis, tumor, hydrocephalus, and caries of the sphenoid bone. *ε. Descending neuritis.*—This signifies inflammation extending along the optic nerve from within the cranium, the extension probably chiefly taking place along its connective tissue. Hence the optic trunk itself is involved, and the morbid ophthalmoscopic appearances are chiefly confined to the disk, occasionally involving the adjacent retina. The ophthalmoscopic distinctions from ischæmia are thus described: The disk is less swollen, and does not present the steep, one-sided elevation; the main trunks of the vessels are chiefly enlarged and tortuous, and there is not the great increase in number of the minute branches and capillaries observed in ischæmia; the color is less intense and more uniform, with more opacity, and these appearances extend further into the retina; there is often a "woolly" aspect, probably due to œdema. Numerous small hæmorrhages frequently occur, which leave white spots. The intimate changes chiefly affect the connective tissue, which undergoes proliferation, the nerve-fibres being subsequently disintegrated and wasted. A variety has been described as *perineuritis*, in which the outer neurilemma is most affected, the appearances being visible mainly in the margin of the papilla, and extending more widely into the retina. *ζ. Chronic optic neuritis.*—Here there is an early stage of redness of the disk, with in some cases hæmorrhages and slight effusions, followed by consecutive atrophy, the vessels gradually contracting and disappear-

ing. 7. *Retinitis*.—Very rarely resulting from cerebral disease, this is characterized at first by hyperæmia of the disk and retina, followed by silvery patches of exudation upon the latter. The entire retina is probably never affected from cerebral disease. The intracranial causes of all the varieties of optic neuritis are meningitis and cerebritis, in whatever way these may have been set up. The inflammation must be contiguous to the nerve, and the latter is more likely to be affected if the morbid process is severe or prolonged. Tumors and other morbid conditions may give rise to neuritis, but only indirectly, by first exciting inflammation of the cerebral structures. Chronic neuritis is said to be connected with abuse of tobacco, general paralysis, and locomotor ataxy. 8. *Atrophy of the disk*.—Two forms of atrophy are recognized, the simple, progressive, or primary; and the consecutive, which is secondary to ischæmia or neuritis. Dr. Hughlings Jackson distinguishes between them by the raggedness of the edges and blurring of the outline in the consecutive form; by the clean cut even rim and more brilliant appearance in the primary form. Dr. Allbutt, however, considers that the condition described as simple atrophy often succeeds chronic neuritis, and that the ragged and irregular form is only transitional, gradual changes taking place in the products of inflammation, which are finally entirely removed. True primary atrophy may result from destruction of the fibres in the course of the optic nerve, so as to sever their distal ends from their central attachment, as by pressure of a tumor or inflammatory exudation; disease at the root of the nerve in the centres of vision; progressive sclerosis extending along it; or failure of nutrition from degeneration of arteries or embolism. The ultimate appearances in atrophy are that the disk becomes white, glistening, and more or less cupped; the smaller vessels fading away; the connective tissue being increased; and the nerve elements disappearing.

H. There is a peculiar tendency among malingerers to sham nervous affections, and it sometimes requires considerable ingenuity to detect the imposture. In any case where anomalous nervous symptoms are complained of, without any objective signs, malingering should be suspected, and the patient should be closely watched, without letting it appear that this is being done. The tests to be applied will, of course, vary in different cases, but as illustrations may be mentioned the use of chloroform; various methods of detecting shammed fits, as putting snuff under the nose, applying heat or cold suddenly, pressing with the nail under the matrix of the thumb-nail; supporting a supposed paralyzed limb in an extended position and letting it fall suddenly; pricking suddenly a part stated to be anæsthetic, while the patient is not looking; and the use of strong electricity.

I. In all cases of cerebral disorder it is of great importance to examine carefully the heart and vessels; and also to test the urine.

CHAPTER LXVIII.

ON CERTAIN CEREBRAL SYMPTOMS.

I. HEADACHE OR CEPHALALGIA.

ETIOLOGY.—The causes of headache are very numerous, and terms are often prefixed indicating its mode of origin, such as congestive, plethoric, anæmic, organic, nervous, or idiopathic, neuralgic, dyspeptic,

or bilious. The pathological conditions which may give rise to this symptom are: 1. Disturbance in connection with the cerebral circulation, either congestion, especially that due to general plethora, increased cardiac action, vaso-motor paralysis of the cerebral vessels (by inducing which many remote causes excite headache), or venous obstruction; deficiency of blood; or an abnormal condition of this fluid, particularly when it is hydræmic, imperfectly aerated, or impregnated with various deleterious ingredients. 2. Injuries or organic diseases of the brain or its membranes, *e. g.*, meningitis, cerebritis, abscess, tumor, softening. 3. Disease of the cranial bones, their sinuses, or of the structures forming the scalp. 4. Neuralgia, affecting the nerves either within or outside the skull. The chief remote causes which may excite headache by giving rise to some of the above conditions include anything which induces general plethora or anæmia; cardiac or pulmonary diseases, or fits of coughing; affections of the stomach, bowels, and liver; renal and cutaneous diseases; fevers and acute inflammations; ague or mere malarial influence; gout and rheumatism; uterine disorders; hysteria; various causes which exhaust or depress the nervous and vital energy, as sedentary habits, deficient ventilation, over-work in confined rooms, undue mental exertion, depressing emotions, exposure to the hot sun, particularly when fatigued, loss of sleep, over-lactation, venereal excesses and masturbation, abuse of coffee, tea, alcohol, tobacco, opium, and various other drugs which affect the brain. Some individuals are much more subject to headache than others, and especially delicate females of a nervous temperament.

CHARACTERS.—The points concerning which it may be necessary to inquire with reference to headache are: *a.* Its mode of onset, and if it is brought on by any obvious cause. *b.* Whether it is constant or only felt at intervals. *c.* Its exact situation, whether general, unilateral, frontal, occipital, over the vertex, or localized to a spot; and also if it seems to be superficial or deep. *d.* Its characters, the chief varieties being heavy, dull, aching; throbbing; shooting or darting; boring; with sense of fulness, as if the head were going to burst; with feeling of great heat. *e.* Its intensity, and if this is variable or not. *f.* The effects of movement and change of posture, especially moving or hanging down the head; muscular exertion; coughing; light or sound; firm pressure over the whole head or any part of it; taking food or stimulants; or pressure on the carotid arteries. *g.* If it is accompanied with soreness and tenderness over the scalp generally, or over any particular spot.

II. VERTIGO—GIDDINESS.

There are two distinct forms of giddiness, so far as the sensations of the patient are concerned, in the one the feeling being that of motion of the body, and as if it were impelled in different directions, accompanied

with a tendency to fall and unsteadiness of gait; in the other extraneous objects appearing to move and to assume abnormal positions. The sensation is often described as "dizziness" or "swimmings." It varies much in intensity, and may be constant or paroxysmal. In many cases it is only or chiefly felt on movement or in certain positions, especially on hanging the head down. It may be worse when sitting, standing, or in the recumbent posture in different cases; closing the eyes or staring fixedly for a time at an object has often a marked influence on vertigo, either aggravating or relieving the sensation. Occasionally an attack comes on during sleep, awakening the patient. Commonly other head symptoms are present, with disturbances of the special senses.

ETIOLOGY.—Vertigo is directly due to some condition in the brain which either causes it to receive wrong impressions from the special senses, especially that of sight; or interferes with the power of co-ordinating the muscles for movement. Probably there is in all cases some disorder of the cerebral circulation, either general or local, in the way of congestion, anæmia, or an abnormal condition of the blood. The causes of giddiness are either *centric* or *eccentric*, including mainly injury or organic disease of the brain or its membranes; degenerative changes in the cerebral vessels; certain functional nervous disorders, as epilepsy; movements influencing the cerebral circulation, such as swinging or waltzing; febrile conditions; exposure to paludal and other emanations; tobacco smoking; abuse of alcohol or narcotics; renal disease; gout; suppression of chronic cutaneous diseases; hæmorrhages or discharges; anæmia; excessive mental and bodily work, especially if combined with close confinement, anxiety and worry, excitement, bad or irregular living; digestive derangements; organic or functional disorder of the heart affecting the cerebral circulation, especially a weak or fatty heart; irritation of the special nerves of sense, such as a sudden strong light, bad odors, injection of water into the ear, or disease of the semicircular canals. Menière drew particular attention to ear-affections as a cause of vertigo. Many of the eccentric causes are supposed to act in a reflex manner, probably by influencing the circulation.

Certain forms of vertigo call for special notice. The gastric variety is described as occurring either in severe acute paroxysms coming on quite suddenly, often due to an undigested meal, and sometimes assuming a grave character, being accompanied almost with loss of consciousness, or as a milder chronic complaint, either constant or in frequent attacks. The digestive symptoms are not prominent in most of these cases. The vertigo is of both kinds, but consists chiefly of apparent movement of external objects. The chronic form is rendered worse by fasting, and is often relieved by a moderate meal or a little stimulant, also by shutting the eyes or gazing fixedly at some object. Dr. Ramskill describes what he terms *essential vertigo*, which is observed

mostly in persons about 30 years of age, who do not complain of any other symptoms, but in whom there are signs of a weak heart and of a dilated right ventricle. He states that it is not materially improved by remedies, unless these are accompanied by rest and freedom from anxiety of every kind.

III. DELIRIUM.

This symptom implies an acute and temporary disorder of the mental faculties, which generally reveals itself in the language or actions. It varies in degree from slight wandering and incoherence to the most complete and thorough derangement of the mental faculties. Frequently the patient has a fixed delusion. When the delirium is slight the patient can often be roused temporarily, so as to be tolerably coherent. It may be constant, but commonly tends to be worse by night, or may only come on at this time. In character the delirium may be mild and quiet; more or less wild and violent, the patient shouting furiously, or attempting to get out of bed or to injure those around; talkative and cheerful; surly; suspicious; low and muttering, when it is often attended with picking at the bed-clothes or carphology. In many cases delirium is associated with more or less stupor.

ETIOLOGY.—Delirium may arise either from excitement or depression of the cerebral functions, being accordingly either active or passive. It is the gray matter covering the cerebral hemispheres which is specially affected. The causes of delirium are: 1. Organic diseases of the brain or its membranes, especially meningitis. 2. Reflex disturbance in connection with remote organs, as the stomach, bowels, or uterus, particularly if attended with severe pain. 3. A poisoned condition of the blood, as in delirium tremens, acute febrile and inflammatory diseases, imperfect aeration of the blood, poisoning by belladonna and other substances. 4. Nervous exhaustion, as in delirium tremens partly, after excessive venery, or from undue mental exertion. 5. Acute mania. Some individuals are much more liable to delirium than others, particularly children and nervous persons.

TREATMENT.—In order to relieve either of the head symptoms just considered, a point of first importance is to find out its cause, as treatment has in most cases to be directed against this, and must vary accordingly. In persons subject to headache or vertigo, attention to the diet, occupation, habits, and mode of life is frequently most essential. The various organs of the body must also be looked to, especially the digestive apparatus, heart, and kidneys. In many cases a course of vegetable or mineral tonics is highly serviceable. Arsenic proves very beneficial sometimes. When headache is merely temporary, associated with depressed nervous energy, stimulants will often relieve it, such as a little weak brandy and water, spirits of ammonia or chloroform, or a cup of strong coffee. Among local remedies which may be useful

under various circumstances may be mentioned the use of cold, warm or anodyne applications to the head; cold or warm affusion; sustained pressure around the head; sinapisms or blisters to the nape of the neck or some other part; and local removal of blood. Attention to posture may be of importance.

For delirium, if it is of the active kind and attended with much vascular excitement, the measures which may be needed are to shave the head, apply cold assiduously, use cold affusion, or remove blood. In other cases the aim of treatment should be to endeavor to procure sleep by means of some narcotic. Opium, which is sometimes useful combined with tartar emetic or stimulants, hydrate of chloral, or small doses of bromide of potassium, often prove most serviceable. When delirium is of the low type, it is commonly an indication for the free use of stimulants. Warm affusion is often of much value in these cases. An important object to be always borne in mind is the removal from the system of any deleterious materials which may be causing delirium. Of course due precautions must be taken, if necessary, to prevent the patient from injuring himself or others. All external sources of disturbance must be removed, and the patient kept as quiet as possible.

IV. INSENSIBILITY—STUPOR—COMA.

These terms imply more or less suspension of consciousness, depending directly on some condition of the brain, complete coma being attended with absolute loss of sensation, perception, power of expression and voluntary motion, or, in other words, total abolition of all the cerebral functions. In investigating this symptom it is important to take into consideration: *a.* Its mode of onset, whether sudden or gradual, and if it is due to any obvious cause. *b.* Its degree, noting if there are any signs of sensation evinced, as by touching the conjunctivæ, and also whether the patient can be roused temporarily or permanently. *c.* Whether it is transitory or persistent.

ETIOLOGY.—Pathologically loss of consciousness may result from injury to or compression of the brain-substance, extreme cerebral congestion or anemia, or the circulation through the brain of poisoned blood, or such as is inadequate to maintain its functions. Its numerous causes may be arranged thus: 1. Local injury to the head and its consequences, as concussion, fracture of the skull, compression. 2. General shock, from injury, rupture of an internal organ, severe mental emotion, or any other cause. 3. Certain functional nervous disorders, viz., epilepsy, hysteria, convulsions. 4. Diseases of the brain and its membranes, especially congestion, hæmorrhage, effusions in connection with the membranes or ventricles, cerebritis and abscess, embolism or thrombosis, chronic softening, and some cases of tumor. 5. Blood-poisoning from morbid conditions within the system, as uræmia, diabetes, certain cases of jaundice, low fevers. 6. Introduction of poisons

from without, especially alcohol, opium and other narcotics, or prussic acid; also the inhalation of certain gases and vapors, as carbonic oxide or anhydride, hydric sulphide, chloroform or ether. 7. Syncope from any cause. 8. Asphyxial conditions. 9. As special forms may be mentioned the unconsciousness which follows prolonged exposure to cold, sunstroke, a stroke of lightning, or starvation. 10. It must not be forgotten that sudden insensibility is a favorite form of malingering.

TREATMENT.—The measures to be adopted when a person is insensible differ so materially according to the cause of this condition, that no uniform plan of treatment can be laid down. A few general hints may, however, be given regarding the management of the comatose state. The patient should be placed comfortably in the recumbent posture, with the head a little raised, all articles of clothing about the neck and chest being loosened, and plenty of fresh air admitted. If it is known or suspected that the coma is due to poison, or even if there is much doubt as to the cause, there ought to be no hesitation about using the stomach-pump, as it does no harm if properly employed, and may prove most serviceable. If the insensibility depends upon blood-poisoning, as from uræmia, means for promoting elimination, particularly by the skin, are highly valuable. In cases due to cerebral lesion it is well not to interfere too actively at the outset. The chief measures which it may be necessary to have recourse to in order to rouse the patient are shaking and calling loudly; dashing cold water over the face and chest, or cold affusion; application of sinapisms to the nape of the neck and various other parts of the body; the use of electricity; the administration of stimulants, especially by enema; and artificial respiration. In certain cases it may be requisite to remove blood locally or by venesection. It is important to see that the limbs are kept warm in cases of prolonged unconsciousness; that the bladder and bowels are properly evacuated; and that the system is maintained by adequate nourishment, which may be administered by enemata.

CHAPTER LXIX.

CONVULSIONS—ECLAMPSIA.

THE spasmodic movements implied by the term "convulsions" vary considerably in their severity and extent; and as to the parts of the body affected. Thus they may be slight and localized; unilateral; or more or less general. Not uncommonly they are accompanied or followed by partial or complete loss of consciousness. Convulsions are of most consequence in children, in whom a series of "convulsive fits"

are liable to occur from very slight causes. They are frequently preceded by premonitory indications of nervous disturbance, such as twitchings, grinding of the teeth, restlessness or peevishness, which in children should always be looked upon as warnings. It is unnecessary to describe the distortion of the features and the various movements of the limbs and body which may result from the convulsive spasms, there being usually a combination of clonic and tonic, the former predominating. The chief dangers in convulsions arise from implication of the respiratory muscles or glottis; leading to grave interference with breathing; obstruction to the return of blood from the brain; and great exhaustion from extreme violence or frequent repetition of the fits, especially if they prevent sleep for a long period. Serious sequelæ may follow as direct consequences, such as hemiplegia; strabismus; loss of sight, smell, or hearing; defect of speech; or impairment of the mental faculties.

ETIOLOGY.—Convulsions have been immediately attributed to “an abnormal discharge of unstable gray matter” (H. Jackson). They originate in some irritation, direct or indirect, affecting this gray matter. The main causes may be arranged thus: 1. *Centric*. *a.* Injuries to the head, especially fracture with irritation of the gray matter by spicula. *b.* Various organic diseases of the brain and cord or the membranes, viz., all forms of meningitis, hydrocephalus, cerebral hæmorrhage, rupture of an aneurism, embolism, softening, tumor. *c.* Idiopathic, dynamic, or essential. Here the convulsions are independent of any obvious organic mischief, but are supposed to result from some vascular or nutritive disturbance in the brain as in epilepsy, hysteria, or the convulsions induced by strong emotions. *d.* Circulation of unhealthy blood through the central nervous system, *e. g.*, the convulsions which in children sometimes usher in or occur during the course of acute specific fevers or inflammatory diseases; uræmic convulsions; and those which may be associated with imperfect aeration of the blood, of which it is said, rheumatic fever, jaundice, syphilis, tuberculosis, and rickets. In the two conditions last-mentioned, however, the nervous system is probably highly susceptible, and convulsive movements may be excited by very slight reflex disturbance. 2. *Eccentric, reflex, or sympathetic.* In this class of cases the convulsions are due to some reflex irritation, particularly in connection with dentition; digestive disorders; intestinal worms; or the passage of a gallstone or a renal calculus. Occasionally they result from direct irritation of some local nerve; the pricking of a pin in the clothes of a child; application of a blister; or a burn of the skin. Puerperal convulsions are either uræmic or reflex in their origin.

The most favorable periods of life for the occurrence of convulsions independent of organic disease are childhood, especially during the periods of dentition; puberty; when cutting the wisdom-teeth; and at

the change of life. In children the common causes are reflex irritation; the onset of some acute fever or inflammation; tubercular meningitis; or the presence of some chronic constitutional illness. Later in life they are most frequently associated with epilepsy; organic affections of the central nervous system; and uræmia.

TREATMENT.—In treating convulsions the indications are: 1. To look for any reflex irritation and remove this if possible, particular attention being paid in the case of children to the teeth and alimentary canal, lancing the gums, or giving an aperient or emetic if required, at the same time regulating the feeding. It is also well to examine the clothes for any source of irritation. 2. To treat any disease with which convulsions may be associated, such as rickets, tuberculosis, epilepsy, central organic disease, or blood-poisoning. 3. To mitigate or check the convulsive movements. During a paroxysm the recumbent posture; freedom from every disturbance; relaxation of the clothing about the neck and chest; and a free current of cool fresh air are needed. It is not advisable to restrain the movements except in so far as to prevent injury to the patient. Water may be sprinkled over the face and chest. If the convulsions continue, a warm bath containing mustard; ice to the head; warm pediluvia; cold or warm affusion; sinapisms to the nape of the neck, epigastrium, or extremities, are the chief remedial measures which may be employed. Many practitioners resort at once to the application of leeches to the temples or back of the neck, or to venesection, especially in the case of robust children; but in most cases this is needless or injurious, and as a rule removal of blood is only indicated when there are signs of serious interference with the respiratory functions. The principal medicinal remedies used are antispasmodics and narcotics, especially bromide of potassium; hyoscyamus in full dose; opium; hydrate of chloral; chloroform by inhalation; and assa-fœtida by enema. Of course most of these need caution in their administration. It is of the greatest importance to endeavor to procure sleep if this is much interfered with, particularly should there be much exhaustion. 4. To treat the consequences of the convulsions. The chief dangers are from suffocation and exhaustion. For the former removal of blood and artificial respiration are indicated. To prevent or counteract exhaustion, it is extremely important to administer abundant liquid nourishment, especially in the case of weakly or badly-fed children, and if it cannot be taken by the mouth enemata must be employed. Alcoholic stimulants are also most useful in many cases, being sometimes required in considerable quantities, along with medicinal stimulants, such as ammonia, ether, camphor, or musk. The administration of food and stimulants often promotes sleep most efficiently.

CHAPTER LXX.

PARALYSIS.

I. MOTOR OR MUSCULAR PARALYSIS OR PALSY.

MOTOR paralysis is a symptom of the greatest importance in nervous diseases. Some of the main points to be noted with regard to it have already been indicated, and it is only needful further to remark that particular attention must be paid to its mode of onset, whether sudden or gradual; its exact extent and distribution; its degree; whether it is permanent or temporary, constant or variable, or influenced materially by volition, emotion, or other causes; as well as to its subsequent progress, observing whether the paralysis tends to become worse, improve, or invade other muscles; and if any additional phenomena arise in the affected part, especially clonic or tonic spasms, rigidity, or permanent flexion of joints. The tendency in many forms of persistent paralysis is towards imperfect nutrition of the tissues, as evidenced by softness and flabbiness of the muscles and other tissues, wasting and diminution of the circumference of a limb, dryness and scurfiness of the skin; and to feebleness of the circulation, the pulse becoming small and weak, the skin pale or blue and congested, the temperature lowered, while the affected part is much more influenced by the temperature of the surrounding medium than in health, and oedema sets in in some instances. Occasionally an extraordinary growth of hair is observed over a paralyzed part.

There are certain important varieties of paralysis, designated according to its mode of distribution in the body, some of which it will now be requisite to consider briefly. They include: 1. *General paralysis*, which does not necessarily imply that every muscle in the body is affected, but is applied to that condition in which both arms and legs are paralyzed along with more or less of the trunk. 2. *Hemiplegia* or unilateral paralysis. 3. *Paraplegia* or paralysis of the lower extremities; the lower part of the trunk with the bladder and rectum being often involved at the same time. 4. *Disseminated or irregular paralysis*, when the paralysis is distributed in various parts of the body, as for instance in the arm and leg on opposite sides; or in the limbs on one side and the face or eye on the opposite. 5. *Local*, where the palsy is limited to one limb or a part of it; to certain muscles supplied by a special nerve, as the facial, or associated in their action for a particular function; or even to a single muscle.

GENERAL PARALYSIS is met with: (i.) Rarely in cerebral diseases,

viz., temporarily in congestion; hæmorrhage into certain parts, as into the pons, both ventricles, or the meninges; and in some cases of tumor, extensive softening, or meningitis. (ii.) In disease or injury of the upper part of the spinal cord. (iii.) In the early stage of essential paralysis of children. (iv.) As a sequela of diphtheria. (v.) In extreme progressive muscular atrophy. (vi.) In general paralysis of the insane. In the disease last mentioned the paralysis begins in the tongue, as shown by impaired articulation, with tremulous movements and a difficulty in protrusion of the organ. Next the muscles of the face quiver, especially those of the lips, while the pupils are often unequal. Then follows weakness of the limbs, with unsteadiness of gait, the patient stumbling and staggering on turning round suddenly, while the ability to perform various ordinary actions is impaired. More or less speedily, and usually by interrupted grades, the paralysis extends and increases until the patient becomes utterly helpless; is unable to swallow, food passing into the larynx; the pupils are unequally dilated; and urine and fæces escape involuntarily. Automatic and reflex movements also cease. The muscles do not waste much as a rule, and they retain their electric irritability. During the progress of the paralysis twitchings and spasms are common. The muscular sense is much affected. Cutaneous sensibility is generally impaired and finally lost. Mental derangement usually precedes the paralysis; it may assume various types, but in most cases there is a brief period of melancholia, followed by a marked change in character, then incoherence with delusions as to personal importance and greatness, the patient imagining himself to be extremely strong, wealthy, of high birth, or possessed of wonderful sexual powers. The ultimate condition is one of extreme dementia, the mind becoming a complete wreck.

2. HEMIPLEGIA.—In the majority of cases of one-sided paralysis only the muscles of the arm, leg, trunk, lower part of the face, and tongue are involved. In some cases there is a difficulty in wrinkling the forehead or closing the eye; or on the other hand the upper eyelid may drop. Speech is often affected, but usually only in right hemiplegia. If the paralysis is complete the arm and leg are quite helpless, and in the recumbent posture the leg tends to rest on its outer side, with the toes everted. If it is partial, but still well-marked, the gait is usually very peculiar. The patient leans towards the sound side, lifting up the opposite shoulder, and while the arm often hangs helplessly, the leg during progression is carried forward by describing a kind of outward swing or sweep, while the toes are directed downwards towards the ground. In less marked instances the leg merely drags, the toes, however, pointing downwards, while the arm cannot be moved well, and the power of squeezing is diminished.

Not uncommonly partial restoration is effected in hemiplegia, which almost always commences in the leg, beginning above and extending

downwards, the muscles on the front of the leg being last restored. The arm may remain for a long time or even permanently disabled. Generally there is no limitation of the reflex movements of respiration on the affected side, at least for some time; further, other reflex movements may be readily excited, sometimes even more easily than in health; while the paralyzed muscles of expression can in some instances be brought into play under the influence of strong emotion. Electric irritability is not impaired as a rule, except after long disuse of the muscles, and then it can be soon restored.

ETIOLOGY.—(i.) Hemiplegia is in the large majority of cases a sign of organic cerebral mischief, the paralysis being on the side opposite to that of the disease. The great centres of motion, viz., the corpus striatum, and anterior part of the optic thalamus, must either directly or indirectly be interfered with, and probably hemiplegia may result from actual destruction, compression, hyperæmia, or anæmia of this portion of the brain. The morbid conditions which thus give rise to hemiplegia are: *a.* Rarely congestion, it being then merely temporary. *b.* Hæmorrhage most commonly. *c.* Embolism or thrombosis of a considerable artery. *d.* Acute cerebritis or softening, and abscess. *e.* Chronic softening from any cause. *f.* Cerebral tumor. *g.* Unilateral meningitis. (ii.) In very exceptional instances hemiplegia results from unilateral disease of the spinal cord. Of course there is then no facial paralysis. (iii.) Occasionally it is observed in connection with certain functional nervous diseases, apart from any evident organic lesion, viz., chorea, epilepsy, and hysteria. It may also be associated with parturition.

3. PARAPLEGIA.—This form of paralysis varies much in degree, and comes on either gradually, rapidly, or suddenly. When it is complete, the utter helplessness of the legs as the patient lies or when made to attempt to stand supported on each side, is very striking; in less advanced cases there is more or less weakness and difficulty in movement, with unsteadiness of gait, dragging of the feet, and stumbling while walking. Reflex movements are usually very easily excited. The condition of electric irritability varies.

ETIOLOGY.—(i.) Paraplegia is in the large majority of cases the result of injury to or disease of the spinal cord. Thus it may be due to: *a.* Fracture or dislocation of the spinal column; or a wound or violent concussion of the cord. *b.* Compression of the cord from without by a tumor. *c.* Caries of the spine and its consequences. *d.* Congestion, when the paralysis is usually partial. *e.* Spinal meningitis. *f.* Acute myelitis. *g.* Chronic softening or sclerosis. *h.* Hæmorrhage into the cord. *i.* Morbid growths or parasites in its substance. (ii.) Sometimes paraplegia is a purely functional disorder, being met with in hysteria or as the effect of some powerful emotion; and also as a reflex

phenomena in connection with uterine affections, pregnancy, urinary diseases, dentition, or worms; or after exposure to cold and wet.

4. LOCAL AND SPECIAL PARALYSES.—It is not intended here to describe the many varieties of local paralysis which may come under observation, but merely to point out their general causes, and to consider the chief facts relating to paralysis of certain special motor nerves.

Local palsy may be an indication of slight or commencing central disease, but in the majority of cases the cause is peripheral, either directly affecting one or more nerves or certain muscles. This peripheral paralysis may be due to: (i.) Destruction of a nerve from injury. (ii.) Pressure upon it by a tumor, aneurism, or inflammatory thickening; or mere temporary compression, as from long sitting or lying on the arm. (iii.) Changes induced in the nerve itself, probably mostly inflammatory, from neighboring irritation, as that of necrosed bone or ulceration; exposure to cold; syphilis; rheumatism or gout. (iv.) The entrance of certain poisons into the system, especially lead; or, it is said, malarial poison. (v.) Changes in the muscles, either atrophic or degenerative, as in progressive muscular atrophy. Local paralysis may be a sequela of diphtheria; or more rarely of other febrile affections. It may also result from local embolism.

FACIAL PARALYSIS—BELL'S PALSY.—Paralysis of either facial nerve, and consequently of one side of the face, is the most important local variety that comes under observation in practice, the entire nerve being then usually involved. The signs are as follows: There is a complete absence of expression on the affected side, which appears flattened and smooth, the features being blank and meaningless. The half of the mouth seems broader than the opposite, while the angle falls. Sometimes saliva flows from the mouth. The ala of the nose falls in, and consequently the nasal aperture is diminished in size. The healthy side appears to be or is actually drawn away, and the angle of the mouth raised. The eyelids on the paralyzed side are unusually apart, the lower one dropping down, and as they cannot be closed the tears tend to trickle down the cheeks; the corresponding nostril is dry; and the constant exposure of the eyeball soon leads to irritation of the conjunctiva, which is liable to be followed by serious injury to the deeper structures. It is, however, on attempting to bring the affected muscles into play that the most evident signs are afforded. The patient cannot smile, weep, wrinkle the forehead, elevate the eyebrow, frown, close the eyelids, knit the brows, or expose the teeth on the paralyzed side. Articulation of labial sounds is impaired, as well as the ability to whistle; while if the patient is directed to blow out the cheeks, the affected one flaps loosely. When masticated the food tends to collect between the cheek and gums, while fluids often run out of the mouth; the power of spitting is also impaired. If the facial nerve is implicated in a certain part of its course, other less obvious signs are said to be

observed, dependent upon some of its branches being distributed to the tongue, salivary glands, and palate, viz., perversion of taste on one side, and occasionally slight drawing of the tongue towards the same side; deficient secretion of saliva; relaxation and imperfect action of the velum palati on, and pouring of the uvula towards the affected side; with a somewhat nasal character of the voice.

ETIOLOGY.—It is of considerable importance to recognize in what part of its course the facial nerve is implicated, and to determine the cause of the mischief. The causes of facial paralysis may be summarized thus: (i.) Organic mischief in the brain involving the root of the nerve. (ii.) Pressure upon the nerve within the skull after it has left the brain, especially by various kinds of tumors and meningeal exudations. (iii.) Injury or disease involving the nerve in its course through the temporal bone, chiefly from necrosis of the petrous portion of bone or gunshot injury. (iv.) Causes affecting the trunk or branches of the nerve after its exit from the stylo-mastoid foramen, viz., injury, as from a cut or contusion; pressure by parotid and other tumors or enlarged glands; direct exposure of the side of the face to a cold draught of air, as in travelling by train with the window open; general exposure to cold and wet; gout, rheumatism, syphilis; or, it is said, malarial influence.

DIAGNOSIS.—The diagnosis of the origin of facial paralysis rests on: 1. The history of the case, as revealing some of the causes just enumerated; and also the mode of onset of the paralysis, whether sudden or gradual. 2. The accompanying symptoms. Thus, when the paralysis is due to cerebral mischief, there are generally signs of this, such as hemiplegia and mental disturbance; if there is some intracranial pressure beyond the brain, headache and other local symptoms are commonly complained of, while other cranial nerves are frequently involved, and there is sometimes paralysis of the limbs on the opposite side. If the temporal bone is diseased, deafness and otorrhœa are usually present. If the nerve is affected outside the skull, some cause of pressure may be obvious; there may be no symptoms whatever except the paralysis; or the sensory nerves of the face are sometimes affected as well, in the direction of neuralgia or anæsthesia. 3. The extent of the nerve involved. When facial paralysis arises from cerebral causes, it is only the lower part of the face which is in most cases prominently affected, the muscles of the eyelids and forehead either acting normally or being only slightly weakened. In all the other forms the whole side of the face is paralyzed. It is only when the nerve is implicated in its course through the temporal bone that the palate and tongue are affected. 4. The degree of electric irritability. In cerebral paralysis electric irritability is retained, unless the disease lies at the origin of the nerve; in all the other forms it is impaired or lost temporarily or permanently, except when due to cold, when there may be increased irritability to a slow galvanic current. 5. The progress of the case and effects of treat-

ment. For instance, when due to tumor, injury, or bone disease, the paralysis is generally persistent; after cold, rheumatism, or syphilis, it may often be cured by proper treatment.

In very rare instances double facial paralysis is observed, but it is difficult to recognize. It may be due to centric disease, especially hæmorrhage into the pons; or, it is said, disease of the nerves from exposure to cold, rheumatism, or syphilis.

PARALYSIS IN CONNECTION WITH THE EYE.—The nerves to be considered here are the *third*, *fourth*, and *sixth*. Complete paralysis of the third nerve is indicated by ptosis or dropping of the upper eyelid, with inability to raise it; permanent external strabismus; dilatation of the pupil; and a difficulty in adapting the eye to vision at different distances. In some cases only ptosis is observed when the paralysis is peripheral in its origin. The cause may be centric disease; pressure upon the nerve in its course; exposure to cold; or rheumatism. When the fourth nerve is paralyzed, the superior oblique muscle cannot act. Paralysis of the sixth is evidenced by persistent internal strabismus. These forms of paralysis are generally associated with some pressure in the course of the nerves, especially by a tumor or meningeal exudation. Sometimes all the nerves of the eye are simultaneously affected.

PARALYSIS OF THE TONGUE.—As a rule unilateral paralysis of the tongue, dependent upon implication of the *hypoglossal* nerve, is a part of hemiplegia. The signs are: a widening of the tongue on the affected side; difficulty in its movement and protrusion; deviation of the organ to the sound side when in the mouth, to the paralyzed side when protruded; and impaired articulation. The entire tongue may be paralyzed, rendering articulation impossible, and deglutition very difficult.

It will be convenient here to make a few remarks with regard to *aphasia*, a term which is now in frequent use, and the meaning of which it is requisite to understand. An individual may not be able to make a proper use of articulate language from three distinct sets of causes: 1. There may be mental incapacity and loss of intellectual power, so that no ideas are originated in the mind which the individual wishes to convey. 2. The intellect may be intact, or at least not so impaired as to prevent the formation of ideas, but the patient cannot recollect the words requisite to express his thoughts, or cannot arrange them in a proper manner. 3. There may be merely a difficulty in the mechanical act of articulation, owing to paralysis of the parts necessary for this act, viz., the tongue, lips, and palate, the power of thought and also of expression, as evidenced by the ability to write sensibly, being perfectly natural. It is to the second of these conditions that the term *aphasia* is strictly applied, viz., where articulate language is interfered with as an intellectual act. The degree of impairment varies widely in different cases. A distinction has been made between the *amnesic* variety of aphasia, in which there is a loss of memory of words; and the *ataxic*,

in which there is a presumed lesion of the cerebral apparatus of co-ordination, so that the words cannot be duly arranged. Some patients can read distinctly enough, but are unable to compose sentences for themselves, even so far as to answer the simplest question. They may merely repeat the same word or part of a word, or only unintelligible sounds; or they apply wrong names to persons and things. With regard to writing, some patients are able to perform this act, while others cannot do so at all, the last being generally the subjects of right hemiplegia. Those who can write occasionally write sense, frequently nonsense, but more frequently either unintelligible characters or distinct but unconnected words (Reynolds). As a rule the mental condition in aphasic patients is more or less impaired, but the degree of impairment ranges from what is scarcely appreciable to complete loss of mental power.

Aphasia is in the large majority of cases associated with right hemiplegia, and the morbid condition to which it is most frequently due is embolism of the left middle cerebral artery, as was first pointed out by Dr. Hughlings Jackson. It may depend upon tumor, hæmorrhage, softening, meningitis, and other cerebral lesions; and I have known it to arise temporarily from mere vaso-motor disturbance. As regards the localization of the lesion in the brain, many adopt the view of Broca, that the second and third left frontal convolutions of the cerebrum are the seat of the faculty of articulate language, and that these must be interfered with when aphasia is observed. Others consider that there must be a lesion of some part of the corpus striatum, or of certain motor nuclei or intercommunicating fibres in its neighborhood. Niemeyer partly explains the frequency of aphasia in connection with disease of the frontal lobes by the fact that pressure acting on one side in this region is readily propagated to the opposite, so that the brain becomes bilaterally disordered.

PARALYSIS OF THE PHARYNX is mainly indicated by great difficulty or impossibility of swallowing, and thickness of speech. When the *inferior maxillary* nerve is involved the muscles of mastication are paralyzed.

TREATMENT.—The objects to be aimed at in treating paralysis of any part are to restore the muscles to their normal activity as speedily as possible, if this is practicable; and to counteract the tendency to those atrophic and other changes to which the structures are liable. Of course the measures to be adopted must first of all have reference to the cause of the paralysis, by removing which restoration is often rapidly and completely effected. As illustrations may be mentioned the use of iodide of potassium in the treatment of paralysis due to syphilis or lead. In many forms of paralysis time is a most important element in treatment, and much harm may be done in not a few instances by interfering too actively or too soon. It is requisite to see that a para-

lyzed part is properly covered with warm clothing, and that it is kept clean. The chief local measures employed to counteract palsy are systematic passive motion of joints, which may be combined with efforts at voluntary movements; various baths and douches, either hot or cold; friction, either with the hand alone, with flesh-brushes or gloves, or with some stimulant liniment; shampooing; and electricity, which also may be carefully combined with voluntary attempts to move the muscles.

The employment of electricity in the treatment of paralysis demands special notice, and it will be convenient here to give a brief summary of the main facts pertaining to this subject, derived chiefly from Dr. Reynolds's work. Much discrimination and caution are needed in resorting to this agent, as it is very powerful for evil as well as for good. The beneficial results which electricity is capable of effecting in paralysis are as follows: 1. Restoration of the functions of a muscle or nerve when its activity is impaired, and thus possibly restoration of voluntary movement. 2. Prevention of wasting of the muscles, and consequent arrest of the progress of the disease. 3. Increase in the vascularity of a part, thus removing coldness, blueness, and other signs of feeble circulation. 4. Improvement in the nutrition of the muscles, nerves, and other structures, should they be atrophied or ill-nourished. 5. Prevention, retardation, or removal of spasmodic contractions and rigidity. 6. Probably the long-continued use of electricity may improve the nutrition of the part of the nerve-centre from which the nerve which supplies the affected muscles originates. The kind of electricity required varies in different cases, but it may be stated generally that for promoting the action of muscles faradization and the interrupted galvanic current are most useful, though franklinic electricity is occasionally more beneficial than either; that for improving the circulation and nutrition the continuous galvanic current or faradization by means of a metallic brush answers best; whilst to oppose the excessive action involved in spasmodic movements and rigidity (and this applies to these conditions under all circumstances) a weak constant galvanic current or very rapidly-interrupted faradization may be applied to the affected muscles; or in certain conditions of rigidity the use of faradization or interrupted galvanism to the antagonistic muscles is most efficacious.

Some general hints as to the employment of electricity in treating paralysis may be serviceable. Care must be taken not to frighten the patient. The current used must not be so strong as to cause pain; or on the other hand so weak as to be useless; and the application should be brief, so as not to tire the patient or the muscles. It may be repeated twice a day, daily, or every other day, according to circumstances. In employing galvanism, one handle containing a sponge of sufficient size and well wetted must be kept fixed in one spot, as over the shoulder or in the bend of the elbow in the case of the upper extremity, and the other drawn slowly along the muscles in succession. With

faradization the two poles must be kept near together, and it is almost always best to hold both in one hand and draw them along each muscle. More action is excited at certain spots, which generally correspond to the points where the nerves entering the muscles are most superficial. In treating paralysis of a special nerve, one handle must be placed over the trunk of the nerve, and the other moved about or not, according as galvanism or faradization is employed.

A few observations will now be offered on the uses of electricity in the chief varieties of paralysis.

(1.) *Cerebral*.—In cases of sudden cerebral paralysis, electricity must on no account be used for some time, even for purposes of diagnosis or prognosis, and the greatest care is necessary for a long period. Even if the paralysis has been gradual in its onset, caution is necessary should there be head-symptoms, such as headache, sense of weight, or giddiness. Much improvement may be effected in other cases in the various directions already indicated; but so far as the paralysis itself is concerned, the value of electricity will depend on the degree of contractility shown by the muscles on its first application. If this is normal or nearly so, the power of voluntary movement can be but slightly if at all increased by its application. If it is much diminished from want of use, much good may be done by reviving the contractility of the muscles, but once this has become normal no further improvement as regards voluntary motion can be effected.

(2.) *Spinal*.—If the muscles act readily under electricity in cases of complete spinal paralysis, the power of voluntary movement in the limbs cannot be increased by its use, but sometimes the functions of the bladder, rectum, or sexual organs may be much improved by its local application to the anus or perineum. If the paralysis is partial and contractility is impaired, much good may be effected up to the point of restoring the contractility; electricity must not, however, be employed in acute cases of this kind, but it is of the greatest value in those which have set in slowly. If there is atrophy of the limbs, galvanism is most efficacious; if none, faradization. Should there be the complete "spinal paralysis" of Marshall Hall, electricity cannot improve the power of movement, and if no sign of contractility is observed after a few applications, it is useless to proceed with it; if the contractility is merely impaired, much improvement may often be brought about. In cases of infantile paralysis due to spinal disease, the use of the slowly interrupted galvanic current frequently proves very serviceable for a time when other forms of electricity fail, but as the muscles improve in their action faradization becomes most efficacious.

(3.) *Local*.—Should a nerve be completely destroyed in its course, and electric contractility be quite extinguished, no improvement can be effected by electricity. In some cases, however, the morbid changes in the nerve disappear, but more or less paralysis persists from want of

use. Here electricity is of great service, and it will be well in such cases to continue its application for some time, provided any contraction can be excited. In certain cases of local paralysis from lead, cold, and other causes, the use of a slow galvanic current has most effect upon the muscles, as previously explained. Under such circumstances, therefore, this should be used at first, and a gradual change made to faradization as improvement is perceived.

A few special remarks are needed with reference to the treatment of facial paralysis from cold. The local application of heat and moisture constantly, leeching, and steaming, are the measures which are most useful at first; followed by blistering, friction with stimulating liniments, and the employment of a slow galvanic current. Iodide of potassium, quinine, or strychnine act beneficially in some cases.

II. SENSORY PARALYSIS—HYPÆSTHESIA—ANÆSTHESIA.

This subject needs but a brief consideration. Tactile sensibility may be more or less diminished or completely lost. The distribution of the paralysis presents the same variations as in the case of motor palsy, the two conditions being often combined, and the etiology is to a great extent similar. With regard to hemiplegia it is found not uncommonly that the muscles are paralyzed when sensation is intact; or this may be impaired at first, but is afterwards speedily restored. In most cases of paraplegia both sensation and motion are implicated. When a local nerve is paralyzed, if it is a compound one, sensation and motion will also be equally impaired. One of the best illustrations of paralysis of a purely sensory nerve is that of the *superior maxillary*, or its continuation the *infra-orbital*; sensation is then lost in the parts to which this nerve is distributed, and when the patient attempts to drink out of a glass or cup a very curious feeling is experienced, as if the vessel were broken opposite the middle of the upper lip. Nutrition and secretion are frequently seriously interfered with when sensory nerves are paralyzed.

TREATMENT.—The general remarks made as to the treatment of paralysis of motion apply equally to that of sensation. Local warmth, friction, and electricity are often useful. The latter must not be resorted to for some time in anæsthesia or hypæsthesia from cerebral causes, and even then only very cautiously; it does not lead to much improvement in most of these cases. Faradization with a brush acts best. Electricity is often very beneficial in various forms of sensory paralysis met with in hysteria, either faradization or franklinic electricity being employed, the latter by directing sparks on to the affected part; charging this and then drawing sparks; or applying a small charge from a Leyden vial. If sensibility is lost locally from destruction of a nerve, no benefit can be anticipated from electricity. When motor and sensory paralysis are combined, electrical treatment directed to the former may

improve the latter at the same time. Particular care is necessary in cases of sensory paralysis as regards cleanliness and avoidance of pressure.

CHAPTER LXXI.

NEURALGIA.

NEURALGIA or nervous pain is a comprehensive term applied to certain painful affections occurring in different parts of the body, the pain appearing to follow the distribution of particular nerves and having special characters. It will be convenient first to consider the general etiology, pathology, and clinical features of the complaint, and then to allude briefly to its principal varieties.

ETIOLOGY AND PATHOLOGY.—In a large proportion of cases neuralgia is distinctly dependent upon some general or constitutional condition. The causes which may give rise to such a condition are: 1. Exposure to malaria. 2. The presence of certain metallic poisons in the system, as lead, mercury, or copper. 3. Whatever tends to induce anæmia or general malnutrition and debility. 4. Various causes which lead to depression and weakness of the nervous system, as prolonged worry and anxiety; undue mental exertion; strong emotion; general concussion of the nervous system, as from a railway collision; hysteria; excessive fatigue; exposure to heat; ennui and luxurious habits; excessive venery. 5. Degenerative changes associated with the decay of life, and those which precede the onset of locomotor ataxy. 6. Rheumatism, gout, syphilis, or exposure to cold and wet. In the cases last-mentioned, however, neuralgia is probably mostly the result of inflammatory and other changes in the nerve itself; or of pressure by surrounding thickening of fibrous membranes or by deposits.

An important group of causes of neuralgia act locally, including: 1. Injury to a nerve in some part of its course, as from contusion; wound by a needle; partial section; the lodgment of a foreign body, such as a piece of glass, when the pain may be felt in some distant part. When a nerve is completely cut across, either itself or some other nerve related to it now and then becomes subsequently the seat of neuralgia. 2. Pressure, *e. g.*, by foreign bodies, such as a bullet; cicatricial thickening or old adhesions; neuromata; tumors, aneurisms, or enlarged glands; callus uniting fractured bones; congested veins; or from long sitting, tight boots, or hanging the arm over a chair. 3. Irritation of a nerve by necrosed bone, especially when it passes through a foramen or canal in this condition; carious teeth; surrounding inflammation or ulceration; or direct exposure to a cold draught. Even when neu-

ralgia is local in its origin, its occurrence is greatly influenced by the general state of the system, and Anstie went so far as to affirm, "it is universally the case that the existing condition of the patient at the time of the first onset of the disease is one of debility, either general or special." Among the chief *predisposing causes* may be mentioned the female sex; certain periods of life, especially that of sexual development, and about or beyond middle age; hereditary tendency to nervous affections; and a nervous temperament. An acute attack is predisposed to or intensified by fatigue or any other lowering influence. It may come on quite spontaneously; or be brought about by mental disturbances, pressure, cold, heat, over-exercise, and numerous other influences.

Pathologically neuralgia may be connected with some evident morbid change in the affected nerve or nerve-centre, but as a rule no such obvious change can be detected. Probably in some cases the nerve is more or less congested or inflamed. Marked atrophy with degeneration of a nerve has been found in connection with neuralgia from pressure, occasionally so advanced as almost to render sensation extinct. Anstie writes, "I think it most probable that in *all* cases of neuralgia there is either atrophy, or a tendency to it, in the posterior or sensory root of the painful nerve, or in the central gray matter with which it comes in closest connection."

SYMPTOMS.—Pain is the essential symptom of neuralgia. The important characters of this pain are as follows: 1. It is almost invariably unilateral. 2. In recent cases it is distinctly intermittent, coming on in more or less sudden paroxysms, usually at irregular intervals, but occasionally at regular periods, especially in malarial cases; later on it is only more or less remittent. 3. The pain during the paroxysms is generally severe, in some cases most excruciating, being described by such terms as stabbing, piercing, boring, burning, or screwing, also shooting from a point along some of the branches of the nerve affected, but rarely all; the darts, twinges, or "tics," in some instances come on with the suddenness of an electric shock, giving rise to intolerable agony. The pain may extend to contiguous or even distant nerves. Frequently strong pressure over the chief point affords relief; in other cases gentle friction has the same effect; in others, however, there is exquisite tenderness. The paroxysmal pain often ends as abruptly as it commenced, with a sense of extreme relief and comfort. The pain in the intervals is much less severe, of dull or aching character, and in the superficial neuralgias presents circumscribed points of tenderness, "points douloureux," corresponding to the exit of branches of the nerve through bony foramina or openings in fibrous membranes, though they appear to the patient to be diffused beyond these spots, in some cases giving the sensation of tolerably extensive contusions. It is not practicable in a treatise like this to indicate the seat of all the tender

spots noticed in the different local neuralgias, but a knowledge of the distribution of the nerve affected and of the points at which its branches become superficial, will enable their situation to be recognized.

There are certain general facts to which it is desirable to allude. When neuralgia is local in its origin, the pain usually sets in more gradually; is more constant; and less capable of relief. In advanced age neuralgia is commonly very severe and intractable, the points of tenderness being often intensely painful. Once an attack has happened, there is always a liability to its recurrence, and it may be repeated at regular periods. An individual may have had neuralgia when young, and then be quite free from it for many years, but again subject to the complaint at a later period of life. Different nerves may be implicated in different attacks, or even during the same.

Some interesting *complications* are often associated with neuralgia affecting sensation or motion; the state of the vessels; nutrition and secretion. The chief of these which have been noticed include local hyperæsthesia, hypæsthesia, or paresthesiæ, such as numbness, tingling, or formication; disturbances of the special senses, especially those of sight; spasmodic twitchings, tonic spasms, convulsive movements, or even local paralysis; pallor, followed by redness of the skin, pulsation of the arteries, increase in temperature, and swelling of the affected part, with subcutaneous œdema; hypertrophy or atrophy of the tissue in prolonged cases, or increase of adipose tissue; increased firmness, falling off, or whitening of the hair; the breaking out of skin eruptions, *e. g.*, herpes zoster, or acne; increased vascularity of the conjunctiva, conjunctivitis, iritis, and other morbid conditions of the eye; periostitis, swelling or unilateral furring of the tongue; erysipelatoid inflammation of the tissues to which the affected nerve is distributed; impairment of gastric secretion; increased flow of saliva or tears; local increase of perspiration.

VARIETIES.—Neuralgias are primarily divided into: I. *Visceral*, including, 1. *Cardiac*. 2. *Hepatic*. 3. *Gastric*. 4. *Periuterine and Ovarian*. 5. *Testicular*. 6. *Renal*. II. *Superficial*, viz., 1. *Tic douloureux*. 2. *Hemicrania or Migraine*. 3. *Cervico-occipital*. 4. *Cervico-brachial*. 5. *Intercostal*. 6. *Mastodynia or irritable breast*. 7. *Lumbosacral*. 8. *Sciatica*. 9. *Crural*. The visceral group will not be further alluded to, some of them having been already considered under their respective organs. The names applied to the several forms of superficial neuralgia will indicate their respective localities, but a few need special comment.

TIC DOULOUREUX—BROW-AGUE—PROSOPALGIA.—This is one of the most common forms of neuralgia, the *fifth* or *trigeminal nerve* being involved. Rarely are all the divisions implicated, and it is the ophthalmic branch which is most frequently affected, the pain, therefore, being chiefly felt above the orbit and about the temple. Numerous points of tenderness are described, but the most important are the

supraorbital and *parietal*, the latter being just above the parietal eminence, and corresponding to the inosculation of several branches. A variety of this neuralgia is named *clavus hystericus*, in which there is extreme pain, in character as if a nail were being driven into one or more spots, usually corresponding to the supraorbital or parietal points.

HEMICRANIA—MIGRAINE OR MEGRIM—SICK HEADACHE.—Considerable attention has been paid of late to the complaint recognized by the above names. It will be convenient to treat of it here, as it is considered by many pathologists to be a form of neuralgia, though opinions are by no means unanimous as to its nature. Most authorities regard sick headache as being quite independent of any morbid state of the alimentary canal, and as essentially a nervous affection. Allbutt, however, considers that derangements of the abdominal viscera have an important influence in giving rise to migraine. The chief views as to the pathology of this malady are as follows: 1. That it is a form of neuralgia of the ophthalmic or occipital nerve; or of the filaments distributed to the dura mater. Some regard this neuralgia as merely due to peripheral causes, but Anstie, who was strongly in favor of migraine being a form of trigeminal neuralgia, attributed it primarily to a morbid condition at the root of the nerve in the medulla oblongata, its central nucleus in this part being the seat of atrophic molecular irritation, which has an unusually strong tendency to communicate itself to the neighboring and closely connected nucleus of the vagus. 2. That the complaint is due to vaso-motor disturbance affecting the vessels of the head, produced through the sympathetic nerve. Latham considers that in the premonitory stage of sick headache the small arteries are contracted, owing to excitement of the vaso-motor nerves, which depends upon a weakening of the controlling power exercised over them by the cerebro-spinal system, this probably originating in the medulla oblongata. During the stage of headache it is supposed that the nerves become paralyzed and the vessels consequently dilated, and Latham is of opinion that this paralysis is the result of depression following the previous excitement. 3. Liveing in his admirable work has advanced the hypothesis that the paroxysms of migraine are due to "nerve-storms, traversing more or less of the sensory tract from the optic thalami to the ganglia of the vagus, or else radiating in the same tract from a focus in the neighborhood of the quadrigeminal bodies."

The chief *predisposing causes* of migraine are the female sex, attacks being peculiarly liable to occur about the menstrual periods; hereditary tendency to the complaint, or to various other neuroses; anæmia and general want of tone; and a nervous, excitable temperament. A paroxysm often comes on without any obvious *exciting cause*; but it may follow errors in diet; exposure to the sun; breathing vitiated air; undue mental excitement or effort; fatigue, especially with fasting; excessive sexual indulgence; and various other causes which lead to

physical or mental depression. Sometimes it results from some turbance affecting the sight or hearing.

SYMPTOMS.—Sick headache is characterized by periodic attacks, which usually commence during the period of bodily development from 15 to 25; as a rule becoming more frequent and severe up to a certain time, but tending to diminish in frequency or even to cease altogether in advanced age, particularly after the change of life in women.

An attack is generally ushered in by some premonitory symptoms, which are mostly observed when the patient awakes in the morning, such as a sense of depression, heaviness, or general uneasiness; vertigo; disturbed vision, especially a wavy glittering; chilliness or shuddering; coldness of the hands and feet; tingling in the arms and tongue; irritability of temper; yawning, gaping, or sighing; disordered speech or hearing; disinclination for food, with a slimy taste. Soon after the pain commences and speedily becomes intense. Almost always the attack is unilateral, felt chiefly in the supraorbital region or sometimes within the orbit, but not uncommonly extending over the whole side of the head. The precise character of the pain varies much in different cases, but it is generally throbbing. Pressure on the carotid artery usually diminishes its intensity. There is increased local heat, and in many cases redness of the conjunctiva is observed, with an excessive flow of tears. During a severe paroxysm the patient usually takes to bed, is extremely depressed and low, dreads every disturbance, begs to be left at rest, and is especially sensitive to light and noise. The pulse is frequently slow and soft. The pupils are contracted. When the suffering reaches its height, nausea and bilious vomiting generally set in, aggravating the pain, but afterwards this gradually diminishes, and the patient usually falls asleep. Anstie remarks that this vomiting is ordinarily remedial but that it "merely indicates the lowest point of nervous depression." Vomiting may be directly beneficial, however, when there is much undigested food in the stomach. On awaking from sleep it is found as a rule that the pain has ceased, but there is frequently a little superficial tenderness for a day or two, and the patient feels drowsy of sorts. The duration of an attack is very variable in different cases, but it does not commonly last more than twenty-four hours, though it may go on for two or three days or more.

INTERCOSTAL NEURALGIA.—In this variety the pain is felt along the course of one or more intercostal nerves. Those on the left side, especially from the sixth to the ninth, are most frequently affected. There is a constant pain, mostly corresponding to the point of exit of a lateral cutaneous nerve, and increased by a deep inspiration or coughing, and sometimes by moving the arm. Shooting pains are also experienced at intervals, extending from the spine along the intercostal spaces, or from the lateral point backwards and forwards. Three very distinct "points douloureux" can generally be detected, viz., 1. Vertebral. 2. Lateral

opposite the lateral cutaneous branch. 3. Sternal or epigastric, where the anterior cutaneous nerve perforates. This variety of neuralgia is very common in anæmic and chlorotic females. It also frequently precedes herpes zoster, and a very severe and obstinate form is liable to follow the latter in old people. For the diagnosis of this pain from that of pleurodynia or pleurisy, the condition of the patient; the want of connection of the pain with any excessive or prolonged exercise of the local muscles, of any marked exacerbation from their use, or relief from rest; the characters of the pain, with the points of tenderness; and the results of physical examination are generally quite satisfactory. The breaking out of herpes is pathognomonic.

SCIATICA or HIP-GOUT are the names applied to neuralgia in the course of the branches of the sciatic and other nerves about the hip. Generally the pain is mainly seated in the back and outer part of the thigh, but it may affect various parts of the lower extremity, down to the leg or foot. There is generally a persistent and deep pain near the tuberosity of the ischium, which is increased paroxysmally, shooting up or down, either without any cause, or as the consequence of pressure, movement, especially a sudden jerk, or even coughing. The patient is often obliged to walk very carefully, or may be unable to move at all. Local anomalies of sensation; spasmodic movements; cramps; and partial paralysis are very common. Many cases are exceedingly severe and unyielding to treatment. The limb may waste from want of use.

The local causes which most frequently give rise to sciatica are long-continued sitting; direct exposure to a cold draught as in using windy privies; and sitting on a cold or damp surface. Not unfrequently this complaint is associated with gout or rheumatism.

TREATMENT.—The general principles applicable to, and the chief remedies employed in, the treatment of all forms of superficial neuralgia will now be briefly considered. 1. Any local cause of irritation must be removed. In regard to this point a word of caution is necessary respecting "tic douloureux." This complaint is often attributed to decayed teeth, and not unfrequently these are extracted one after another without any improvement resulting, for the simple reason that the neuralgia is not dependent upon this cause at all. 2. It is highly important in the case of those who are subject to neuralgia, to adopt measures to prevent attacks, such as attending to diet and hygiene; wearing warm clothing; regulating the state of the alimentary canal; and, in short, promoting a state of good general health in every possible way; at the same time avoiding every cause which is likely to bring on a paroxysm. 3. Treatment directed to the general state of the system or to some constitutional diathesis is in a large proportion of cases of the utmost consequence. Radcliffe and Anstie have shown the great advantage of the use of fatty elements when nutrition is im-

paired, especially cod-liver oil or Devonshire cream. Iron in anæmic subjects; quinine in full doses, especially in malarial neuralgias; arsenic in the form of Fowler's solution; strychnine or nux vomica, are among the most valuable remedies for neuralgia. In some instances valerianate and other salts of zinc, or nitrate of silver prove serviceable. Phosphorus has been found highly beneficial in many cases. Should the neuralgia be associated with gout, rheumatism, syphilis, or the presence of some metallic poison in the system, treatment directed against such a condition is essential. 4. An important class of remedies are those which have a direct sedative effect on the nervous system, including mainly opium or morphia; belladonna; extract of *Cinchona*; nabis indica; hydrate of chloral; croton-chloral; bromide of potassium; conium; atropine; tincture of aconite; veratria; and ammoniac chloride in full doses. Two comparatively new drugs are said to be very efficacious, viz., eucalyptol, which is an essential oil derived from the *Eucalyptus globulus*; and the tincture of *Gelsemium sempervirens*. These medicines are either given by the mouth; applied to the affected part by means of plasters, liniments, ointments, or tinctures; or, above all, some of them are introduced by subcutaneous injection, particularly morphia and atropine. They are not merely to be used for the temporary relief of pain, but are in many instances most important aids in bringing about a cure, if employed systematically and regularly every day for such a period as the case may require. In using subcutaneous injections, it is best to begin with a very small dose, e. g., gr. $\frac{1}{16}$ — $\frac{1}{8}$ of morphia, and increase it as occasion requires, some cases needing large quantities after a time. As a rule the injection need not be made at the seat of pain, but Anstie recommends that this should be done in advanced cases where there is much hyperæsthesia, and where there is reason to believe that much thickening and hypertrophy exists about the nerve. If necessary the sensibility may be first blunted by ether spray. The use of alcohol demands brief notice. There can be no doubt but that the pain in neuralgia may often be temporarily lulled by the use of alcoholic stimulants, but experience has convinced us that we should hesitate in recommending them, as there is in this complaint a strong tendency on the part of the patient to be taking them at frequent intervals and in increasing quantities, so that the foundation may be laid for confirmed habits of intemperance. 5. Certain anodyne local applications have been alluded to above, the most useful being liniment or plaster of belladonna or opium; tincture of aconite; ointment of aconitine or veratria; and a liniment containing eucalyptol. Among other local remedies which may be serviceable are dry heat or heat with moisture; chloroform liniment; sinapisms; flying blisters; and light linear cauterization. In obstinate cases blistering and even stronger forms of counter-irritation may be required. Cold is useful in some cases, in the form of ice or evaporating lotions, and I have found

much benefit from the application of the ether spray over the seat of pain for a few minutes three or four times daily. A most valuable local method of treatment is that by electricity. The constant galvanic current is decidedly the best as a rule, but sometimes faradization is beneficial, or merely charging the patient from a friction-machine, or afterwards taking a spark from the seat of pain. In employing galvanism it is necessary to use only a very weak current, especially about the head, carefully guarding against giving rise to unpleasant head symptoms; to apply it by well-wetted sponges in the direction of the nerve, the positive pole being placed over the seat of pain; and not to make the application for too long a time, but with frequent repetitions. Surgical interference has been had recourse to in very obstinate cases of neuralgia, the nerve being divided or a piece of it cut out. This treatment is rarely followed by any permanent good results.

It is necessary to make a few additional remarks respecting the treatment of *migraine*. During the premonitory stage of an attack, if this is evident, certain measures may be taken with the view of preventing or mitigating the subsequent headache. The patient should at once retire into a quiet darkened room, and lie down on the side which is usually the seat of pain, with the head low, the extremities being kept warm. Very many remedies have been recommended, but their usefulness probably differs in different cases. The most important are diffusible stimulants, such as a little brandy or sherry and soda-water, champagne, or spirits of ammonia; a cup of simple strong tea or coffee; hydrate of chloral; croton-chloral; tincture of *cannabis indica*; bromide of potassium; nitrate of ammonium; caffeine, either internally or by subcutaneous injection; and the guarana powder, which consists of the powdered seeds of the *Paulinia sorbilis*. This last drug is given in the dose of ten to fifteen grains, but there is much contradiction in the accounts of different observers as to its efficacy, and in my own experience it has had very different effects. The application of a weak continuous galvanic current is sometimes useful. Anstie recommended a warm foot-bath containing mustard, and to breathe the steam from this at the same time. In some cases I have found the administration of an emetic, such as sulphate of zinc, decidedly beneficial. Much relief often results from tightly binding the head with a wet bandage. Probably the steady application of ice or the cold douche might be serviceable in some cases. During the height of an attack it is best to leave the patient in perfect quiet, and not to give food or anything else. In the intervals many of the measures recommended for neuralgia in general are indicated, and among the most useful medicines are strychnine, arsenic, quinine, and bromide of potassium. Tincture of *cannabis indica*, $\text{℥} \frac{v}{x}$, thrice daily, has been found beneficial by several observers. Tincture of *actæa racemosa* has been also recommended. It is requisite to attend to the state of the alimentary canal, and to avoid the causes which are likely to give rise to an attack of migraine.

CHAPTER LXXII.

HYSTERIA AND ALLIED AFFECTIONS.

PATHOLOGY AND ETIOLOGY.—Hysteria is a very complex morbid condition, of the nature of which it is impossible to speak definitely. It belongs to the nervous disorders, but its exact seat cannot be localized, though probably the brain is most disturbed. No characteristic pathological change has been discovered, but there is probably a nutritional derangement of the entire nervous system. The attempt to locate the primary disorder in the sympathetic ganglia, and to attribute the phenomena observed to vaso-motor disturbance, has no sufficient foundation.

Hysteria is infinitely more common among females, beginning usually from 15 to 18 or 20 years of age, but sometimes much earlier or later, in exceptional cases at the change of life. Young girls, old maids, widows, and childless married women are the most frequent subjects of the complaint, and its manifestations often cease after marriage. Hysterical fits are more common about the menstrual periods. These facts have led many to consider the hysterical condition as being primarily connected with some disturbance of the sexual organs or functions, which affects the nervous system. It has thus been attributed to malpositions of the uterus, undue sexual excitement and unsatisfied desire, sexual excess, and disordered menstruation in the way of menorrhagia, amenorrhœa, or dysmenorrhœa. That uterine and ovarian disturbances do help greatly in exciting hysterical attacks in a large number of instances cannot be doubted, but many eminent authorities deny that these constitute the essence of the complaint. Its frequency in women is due to the inherent conditions of their nervous system, often aggravated by their mode of existence. The system may become disordered by many conditions, but the sexual functions assume undue prominence in the mind, and thus any disturbance in connection with them produces an exaggerated effect. In many cases of hysteria there is nothing wrong about the generative organs or functions, when it occurs often enough in married women with families. The improvement which frequently takes place after marriage may be accounted for by the change in habits, thoughts, purposes, occupation, and general surroundings which this usually involves.

Hysteria is in some instances distinctly traceable to digestive disturbances, especially long-continued constipation with accumulation of feces. Causes referable to the mode in which girls are brought

and their general habits of life aid materially in its production, such as want of useful occupation; indolent and luxurious habits; over-petting and spoiling; subjection to the petty worries of fashionable life; keeping late hours at parties; or reading sentimental novels. Temperament and hereditary predisposition to nervous affections may have some influence, but the latter may often be explained by the patient imitating a hysterical mother. In not a few cases hysteria results from depressing influences, such as long-continued anxiety or grief, disappointed affection, overwork with bad feeding and improper hygienic conditions. It may depend upon some definite chronic disease, either local or general. In some instances the condition named hysterical can only be attributed to wickedness and perversity.

The hysterical state is now and then observed in males, but infinitely rarely an actual fit. The subjects of it are usually from 35 to 50 years of age, and its causes are excessive venery or masturbation; overwork with long-continued worry and anxiety; excessive and prolonged mental labor; senile degeneration; or commencing chronic cerebral disease.

The *exciting cause* of the first hysterical fit is generally some powerful and sudden emotional disturbance, but this may be very slight if the patient has previously been in a state of mental restraint with pent-up feelings, or has been subject to depressing influences for a considerable period. Subsequent paroxysms also are liable to arise from a much slighter disturbance than that which brought on the first attack. Suppressed laughter may lead to very severe fits. Occasionally they result from some physical disturbance, as injury, loss of blood, or some acute illness.

SYMPTOMS.—It is impossible to give even an outline of the varieties of clinical phenomena which may be presented in cases of so-called hysteria. There is scarcely a complaint which may not be simulated. In most cases, however, the prominent features are an undue excitability of the emotions, with defect in the power of the will and intellect; alterations in the general cutaneous sensibility and in the special senses, usually in the direction of hyperæsthesia and dysæsthesia; and a tendency to involuntary muscular movements or other disturbance of the motor functions. It will be necessary to describe first the characters of certain paroxysms or *hysterical fits*, and then point out some of the principal phenomena which may be noticed in hysterical persons.

Characters of a Hysterical Fit.—As a rule a fit of hysteria occurs when other persons are present, and never comes on during sleep. The attack is not sudden, but gradually worked up to, the patient generally having time to place herself in a comfortable position and to adjust her dress; it is often preceded by sighing, sobbing, laughing, moaning, nonsensical talking, gesticulation or a feeling of globus hystericus, but not by any peculiar cry. During the actual fit there may be apparent

unconsciousness, but this is not complete, as can be determined by touching the conjunctiva, while the patient is generally aware of what is going on around, and looks out from under her eyelids occasionally. Spasmodic movements are observed, varying from slight twitchings in the limbs to powerful general convulsive movements, or almost tetanic spasms. Patients often struggle violently, throw themselves about, while the thumb is frequently turned in and the hand clenched. During these movements, which may last only a few moments or for an indefinite time, with or without intermissions, there is no lividity of the face or other sign of interference with respiration. Breathing is noisy and irregular, while gurgling and spluttering sounds are frequently produced in the throat and mouth. The pupils are not dilated; in many cases slight internal strabismus is observed, and the eyes are turned up from time to time. The pulse is normal. There is no biting of the tongue, and rarely any foaming at the mouth. The paroxysm generally terminates with crying, laughing, sighing or yawning, and is followed by a feeling of exhaustion, but not usually by coma; though in rare instances the patient falls into a kind of prolonged trance. Frequently abundant eructations of gas take place, and there is often a copious discharge of pale watery urine. Rarely an attack is followed by a state of hysterical mania, in which the patient is not responsible for her actions.

The Hysterical State.—The chief deviations which so-called hysterical patients may present may be considered as they affect the mental, sensory, and motor functions.

a. Mental.—There is defect of will and mental power, while the emotional functions are not under proper control, being very readily excited, and tending to lead to exaggerated actions. Some patients say they cannot perform various acts, such as standing, walking, or speaking, which they do perfectly well when they forget themselves. Frequently the spirits fluctuate very rapidly and without cause, from morbid cheerfulness to despondency, and the hysterical patient sobs, sighs, cries, or laughs without adequate reason. Ideation and thought may be overactive in some respects, but the general intellectual vigor is much impaired. Many hysterical patients talk a great deal of nonsense. They have an exaggerated self-importance; seek attention from others; and are as a rule never so pleased as when they become objects of attraction or sympathy, or are creating a sensation, which accounts for "fasting-girls," trances, some cases of somnambulism, and similar conditions. Many are very restless, irritable, and impatient. Others, however, seem simply indifferent to all around, and remain melancholy, silent, motionless, and apathetic for long periods together, caring nothing about dress or anything else. In some cases a form of mania sets in. Hysterical patients are strongly disposed to take to drinking in excess.

b. Sen Commonly a condition of general exaggerated sensi-

bility, hyperæsthesia, or nervousness exists, both as regards cutaneous sensation and the special senses, an unusually slight stimulus being recognized or producing an undue effect. Further, there is often a condition of dysæsthesia or painful sensation from slight irritation. This is evidenced chiefly by cutaneous tenderness in certain parts, sometimes intense, especially in the left side; along some part or the whole of the spine, slight pressure over which will often cause severe pains to shoot to distant parts; around the joints; and over the abdomen. The tenderness is greatly diminished by taking off the patient's attention, and it is very superficial, signs of suffering being elicited by a slight touch or a pinch of the skin, but not when steady and firm pressure is made, or when a joint is rudely jogged. Dysæsthesia from slight stimuli may also be evinced in connection with the special senses. Spontaneous pains are commonly complained of in various parts, of a more or less neuralgic character, frequently described as very intense, and being especially seated at the top or back of the head, here often assuming the characters of *clavus hystericus*; in the left side; along the back; over the sacrum or coccyx; and in the joints. Paræsthesiæ, such as formication, numbness, tingling, flashes of light, tinnitus aurium, or a peculiar smell or taste are also common. A curious sensation often complained of is that named *globus hystericus*, which is a feeling of constriction or of a "ball in the throat," either fixed there and giving the sensation of choking, the patient making all kinds of ineffectual efforts to get rid of it, or ascending upwards from the epigastrium or even lower than this. In exceptional cases hypæsthesia or even complete anæsthesia of the skin and deeper structures, or of the special senses is observed. Cutaneous anæsthesia is generally limited in extent and irregular in distribution, but may be hemiplegic or paraplegic. The temperature is occasionally reduced. The bladder or rectum may be affected, leading to great accumulation of urine or fæces, of which the patient is not aware.

c. Motor.—Voluntary movements are generally defective, and the power of the will over the muscles is weakened, while all kinds of involuntary movements are exaggerated and very readily excited, viz., those due to emotions, ideas, sensations, reflex irritation, and organic causes. The hysterical patient starts suddenly from any slight disturbance, rushes about under the influence of some notion or other, and does various other silly acts. Spasmodic movements or fixed rigidity of different muscles are not uncommonly observed independently of fits of hysteria, while cramps are very common, as well as spasms of internal organs. Occasionally some form of motor paralysis is noticed; generally it follows a hysterical paroxysm, and is limited to one limb, or more often to a part of it; but it may be more or less hemiplegic, paraplegic, or even general in its distribution. As a rule sensation is not impaired at the same time; the paralysis is incomplete; nutri-

tion is not at all impaired, or only slightly after long duration of the paralysis; while electric irritability is usually unaffected, though electric sensibility may be lessened, and now and then both are diminished or lost. Sometimes rigid flexion of one or more joints is observed, difficult to overcome, which is evidently partly due to voluntary opposition by the patient, and when it is overcome the limb rapidly assumes its former position, sometimes flying back with a sudden spring and jerk. Hysterical paralysis is liable to rapid changes, and may cease suddenly. Under chloroform it completely disappears and power is restored. The important diagnostic marks of hysterical hemiplegia are that it is usually incomplete; that the tongue and face are rarely involved, though there may be ptosis; that the manner of walking is different from that of true hemiplegia, there being merely a dragging of the leg without any swinging movement, while the toes are raised, and when the patient is made to bend forwards the arm is held back. In paraplegia, also, the paralysis is rarely complete, and one leg is more affected, generally the left; movement of the limbs can often be readily performed in the recumbent posture, but when an attempt is made to walk, the patient being well supported on either side, the power and control over the muscles seem to be gone, and she falls when the support is removed, but generally manages to recover herself suddenly when near the ground. The bladder and rectum are usually unaffected. Aphonia is a frequent symptom in hysterical patients, resulting from laryngeal paralysis. Here there is no alteration in the quality of the voice as a rule, but it becomes a mere whisper, and if the patient is asked to make an effort to speak, even the power of whispering may be lost. This aphonia often comes on and disappears with remarkable suddenness, especially under the influence of some strong emotion. Some hysterical patients refuse even to attempt to speak. A curious enlargement of the abdomen is observed sometimes, constituting the so-called "phantom tumor." This region presents a symmetric prominence in front, often of large size, with a constriction below the margin of the thorax and above the pubes. The enlargement is quite smooth and uniform; soft; very mobile as a whole from side to side, somewhat resonant but variable on percussion; and not painful. Vaginal examination gives negative results; and under chloroform the prominence immediately subsides, returning again as the patient regains consciousness.

Most hysterical patients are out of health, many of them being weak and anæmic. Among the numerous symptoms complained of are: *a.* Digestive disturbances, especially flatulence; borborygmi; copious eructations; cardialgia; depraved appetite and fulness after food; obstinate constipation; intestinal colic or gastralgia. *b.* Circulatory disorders, many of them due to vaso-motor disturbance, such as palpitation; tendency to syncope; epigastric pulsation; throbbing of vessels.

coldness of the extremities; sudden flushing and heat of the face. *c.* Respiratory symptoms, *e. g.*, a sense of oppression across the chest; fits of hurried and labored breathing, sometimes assuming a very serious aspect; spasmodic, irritable, dry cough, of long duration, and having a peculiar squeaking, barking, or howling quality; hiccough, and spitting of blood. *d.* Irritability of the bladder, with frequent micturition. *e.* Menstrual disorders.

The exact grouping of the phenomena described is extremely variable in different cases, and also in the same case from time to time. The hysterical state may be permanent; or it only breaks out at intervals with more or less intensity.

It will be convenient here just to allude to certain curious nervous phenomena occasionally observed. 1. *Catalepsy*.—In this condition the will seems to be cut off from certain muscles, and whatever position the affected part is placed in, *e. g.*, a limb, it will remain fixed thus for an indefinite time. It may or may not be accompanied with unconsciousness. Sensation is usually much impaired and may be lost. This condition is sometimes associated with organic disease of the brain, or severe organic visceral disease. 2. *Trance*.—Here the individual lies as if dead, being ghastly pale, circulation and respiration having almost ceased. Persons in a trance have even been "laid out" as dead. 3. *Ecstasy*.—The patient pretends to see visions. Often this is combined with ridiculous dancing movements, such as are practiced by certain religious communities.

DIAGNOSIS.—Attention to the characters described as pertaining to a hysterical paroxysm, and the circumstances under which it arises, will enable it to be distinguished from epileptic and all other kinds of fits. In women hysteria should always be borne in mind as explaining many of the ailments of which they complain. Among the most important affections which it may simulate are diseases of the brain and spinal cord; disease of the spinal column; peritonitis; abdominal tumors; laryngitis, and diseases of joints. The general signs of hysteria; absence of pyrexia, or of the characteristic symptoms belonging to the several affections; peculiar superficial nature of any pain or tenderness present; characters of the different kinds of paralysis as already described; and effects of the administration of chloroform will generally enable a satisfactory conclusion to be arrived at.

TREATMENT.—1. *Of a Hysterical Fit*.—But little interference is needed as a rule. An important matter is to get rid of the numerous officious and sympathizing individuals who generally surround the patient. She should be treated firmly but kindly, an endeavor being made to gain her confidence, first ascertaining, if possible, the cause of the fit. Care must be taken to prevent injury, and the clothes should be loosened about the neck and chest. If anything further is needed, affusion of cold water over the face; applying ammonia to the nostrils;

or closing firmly the nostrils and mouth for an instant, so that the patient cannot breathe, may be resorted to. In obstinate cases a moderate galvanic shock does no harm. If any medicine is needed, spiræa ammonia, with valerian or assafoetida, may be given.

2. *Of the Hysterical State.*—The management of persistent and confirmed hysteria is often very difficult. Mental and moral guidance is most important, and the patient should be taught to look away from herself and her grievances, and to engage in some useful occupation. Any injurious habit must be rectified. Change of scene and associations, with travelling, is often very serviceable. Any cause of discomfort at home or elsewhere should be removed, if possible. General treatment directed to the state of the system and blood is often beneficial; attention being also paid to diet and to the state of the digestive organs. On no account should hysterical patients be encouraged to take alcoholic stimulants. Various symptoms often call for interference. Pains in different parts are best relieved by belladonna or opium plasters or liniments; that about the joints by warm poultices or fomentations sprinkled with laudanum. Hypodermic injections of morphia may be required. For restlessness and sleeplessness bromide of potassium is the best remedy. Paralysis must be treated by electricity; and rigidity counteracted by fixing the limbs in other positions by means of splints or other mechanical apparatus, and by passive movements. If necessary chloroform may be used; this may also be employed to get rid of a "phantom tumor." I have often found aphorism cured by applying a small blister across the larynx, or even a strong belladonna plaster, these probably acting through the mind. In moderate cases the vocal cords may be galvanized, or the patient charged with franklinic electricity and sparks then taken from over the larynx. It is questionable how far such drugs as assafoetida and valerian are useful in hysteria, when used as a means of cure, except in being disagreeable; they are valuable, however, as antispasmodics.

CHAPTER LXXIII.

HYPOCHONDRIASIS.

ETIOLOGY.—The affection thus named is in reality merely a mental condition characterized by inordinate attention on the part of the patient to his own real or supposed bodily ailments and sensations. Adult males of the better class who have no occupation are the usual subjects of the complaint, but it is not uncommon to meet with it among working men in out-patient hospital practice.

SYMPTOMS.—As a rule some actual disease sets up the hypochondriacal state originally, especially digestive or biliary disorders, venereal disease, or some acute illness. In other instances the symptoms are quite imaginary. The precise symptoms complained of vary much, and they are liable to change from time to time, or new phenomena are added, for which the hypochondriac is ever on the lookout. These patients generally present a healthy appearance, and sleep and perform their ordinary functions satisfactorily. They go the round of the “doctors,” if they can afford it; take any amount of physic, which they want to be always changing, being particularly anxious to try any new remedy that becomes fashionable; are delighted to talk about their ailments, often making use of scientific terms; consult every medical work they can get hold of; and are often much addicted to examining their pulse, tongue, urine, and stools. They are very particular about their food and drink, and often as to their dress and general “get-up.” Hydropathic and similar establishments, as well as districts famed for mineral waters, are favorite places of resort for hypochondriacs. Their moral character and their feelings towards friends are unaltered. These cases are always very difficult to improve, and frequently quite incurable. Ultimately they may become wretched misanthropes, and exclude themselves from all society.

TREATMENT.—The main thing in treating hypochondriacs is for the practitioner to try to acquire some control over them, and to make them believe in him, by investigating their case properly, and showing that he takes an interest in and thoroughly understands it. They cannot be talked out of their ailments, but kind argument may often do much, and they should be urged to take their attention off their symptoms, mingle in society, travel, or otherwise occupy themselves. Attention must be paid to bathing, exercise, and other modes of maintaining the general health. The diet and state of the digestive organs should also be regulated. As to medicines, something has generally to be administered, and the best plan is just to treat the prominent symptoms, taking care not to give anything that can do harm. It is often useful to send hypochondriacs to hydropathic institutions or mineral spas, chiefly on account of the change they experience and the society they meet.

CHAPTER LXXIV.

EPILEPSY—FALLING SICKNESS.

ETIOLOGY AND PATHOLOGY.—Epileptiform seizures may be observed in connection with various organic diseases of the brain or its membranes, *e. g.*, meningitis, hydrocephalus, tumor, embolism, softening,

syphilitic disease; in different conditions of the skull or dura mater which lead to pressure upon or irritation of this organ; or in certain forms of blood-poisoning, such as uræmia and saturnism. Epilepsy, however, as a distinct disease, is ranked as functional, for although organic changes have been described in the brain and meninges, these are commonly absent, and when present are probably rather the effects of repeated fits than the cause. One view as to the nature of epilepsy is that it depends upon some nutritive change in the medulla oblongata, upper part of the cord, and vaso-motor centres, which leads to excessive and perverted action in these parts, inducing sudden contraction of the vessels of the brain and cord, as well as of those supplying the muscles of the face, pharynx, larynx, respiratory apparatus, and limbs, to which all the subsequent phenomena of a fit may be traced. According to another theory a sudden discharge of nerve-force takes place from an immense number of nerve-cells at the beginning of a fit, which leads to shock. The remote causes to which epilepsy has been attributed are: 1. Mental disturbance, especially emotional, *e. g.*, sudden fright, prolonged grief or anxiety; also excessive mental work, and undue forcing of the brain in childhood. 2. Physical influences affecting the brain, as a blow or fall on the head, or sunstroke. 3. Certain conditions affecting the state of the blood and general system, such as syphilis, rheumatism, gout, acute specific diseases, pneumonia, pregnancy. 4. Reflex irritation, as from dentition, worms, uterine and ovarian disturbances, sexual excesses and masturbation. Great prominence has been given by some observers to the sexual functions as a cause of epilepsy. 5. Hereditary taint. Undoubtedly this has an important influence in the causation of epilepsy, especially when it comes from the mother's side. In a considerable proportion of cases either epilepsy or some allied neurosis is prevalent in the family. Probably intemperance in the parents, syphilis, or a fright to the mother while the child is in utero, may be the means of inducing a congenital tendency to epilepsy. The complaint is developed at an earlier age in hereditary cases. 6. Idiopathic. This term applies to cases in which no obvious cause can be made out. Age requires special notice as a *predisposing cause*. In the great majority of cases epilepsy is developed between 10 and 20 years of age, and especially at or about the period of puberty. Sex does not seem to have any particular influence. It rarely happens that any immediate exciting cause of a fit can be made out.

SYMPTOMS.—Attacks of epilepsy assume one of two forms, of each of which it will be necessary to describe the typical characters.

1. *Epilepsia mitior—Petit mal*.—This form is characterized by sudden and complete loss of consciousness, coming on without any warning, and lasting only for an instant, or at most for a few seconds; accompanied with slight pallor and subsequent duskiness of the face; loss of all expression; dilated pupils; and often but not always, slight spas-

modic movements affecting the face, respiratory muscles, or limbs. If the individual is speaking, he stops in the middle of a sentence, and generally appears to hold his breath. Voluntary movements cease, but automatic actions go on as a rule, *e. g.*, such as are necessary for standing, sitting, or riding. In some cases there is not absolute unconsciousness, and there may be but a feeling of sudden vertigo—*vertige épileptique*—which causes the patient to cling to the nearest object. After the attack there is some degree of mental confusion, lasting but a few minutes, during which the patient says and does things which he afterwards forgets and denies. There may be a little squinting or a feeling of choking. On recovery there is no recollection of what has happened. These attacks may be preceded by an “aura epileptica,” and they may be premonitory of severe epileptic seizures, or occur in the same subjects. They are frequently followed by serious mental changes, ending in dementia or mania.

2. *Epilepsia gravior*.—*Haut mal*.—The advent of a fit of epilepsy is in a large proportion of cases indicated by premonitory symptoms, varying in duration from an instant to several hours or days. They present great variety, being either subjective or objective, and commonly of a nervous character, affecting the mental condition; general sensation or the special senses; the muscular system; or the vaso-motor nerves. Sometimes they are extrinsic, such as vomiting, obstinate constipation, sallowness of the skin, or fetid secretions. The so-called “aura epileptica” requires a few words of special comment. This is a peculiar sensation, well known to the patient, which in many cases immediately precedes a fit, generally appearing to start from the distal end of a limb, especially the arm, and to run up towards the head, on reaching which part the seizure takes place. Sometimes it only extends from the elbow to the shoulder, or from the leg to the epigastrium, and has been stated to pass from the testicle or uterus to the throat. The sensation varies in exact character, but has been compared to a stream of cold or hot air, and is frequently not unpleasant. It is curious that its ascent may sometimes be stopped and the fit prevented by pressure, which need not be sufficient to stop the circulation, and sometimes this will happen when the pressure is applied to the opposite arm.

Actual attack.—Three marked stages characterize an epileptic fit:

Stage I.—The phenomena of this stage are a single, peculiarly disagreeable cry, yell, or moan in many cases, but not in all; immediately followed by absolute and instantaneous loss of consciousness, the patient falling anywhere, or often appearing as if thrown down; a violent tonic spasm of the muscles throughout the body, beginning generally about the face and neck, the whole muscular system being in a state of extreme rigidity and strain, but not equally so, and hence there is a hideous distortion of the features, limbs, and body, the latter being drawn to one side, and the neck twisted so that the face looks over one

shoulder, while the teeth are firmly clenched, the eyes wide open, and the eyeballs turned up or in ; stoppage of respiration, usually complete, owing to the spasm of the muscles ; change in color of the face almost invariably, in many cases deadly pallor being observed at first, followed by duskiness or lividity, or this may be present from the commencement, or be preceded by florid or dull redness ; marked dilatation of the pupils ; feebleness or cessation of the pulse at the wrist, due to the muscular spasm, for the heart acts forcibly and the carotids throb violently. Practically these phenomena may be considered as simultaneous, the whole stage not lasting longer than from two or three to thirty or forty seconds.

Stage II.—The transition to this stage is abrupt, and is indicated by a restoration of breathing, the respiratory muscles becoming relaxed, and the retained air being expelled. Unconsciousness continues, but severe clonic spasms take the place of the tonic rigidity, usually beginning with twitchings about the face or sometimes in the limbs, but soon extending more or less over the whole body, though often more violent on one side than the other. From these spasms originate the phenomena of this stage, viz., hideous distortion and convulsive movements of the features and eyeballs ; forcible closure and champing of the jaws, causing grating of the teeth, foaming at the mouth, partly due to formation of excess of secretion, which is blown out of the mouth, and biting of the tongue or cheek, the froth being therefore often bloody ; violent convulsive movements of the body and limbs, which are thrown about and twisted in all directions, the fingers being generally bent and the thumb pressed into the palm ; alternate dilatation and contraction of the pupils ; labored, panting, and irregularly convulsive respiratory movements, often attended with sounds due to mucus in the trachea : increasing duskiness or lividity and turgidity of the face, tongue, and body generally, with distension of the veins, some of the smaller vessels sometimes giving way, thus giving rise to extensive petechiæ about the face or head ; profuse perspiration, the sweat being sometimes peculiarly fetid ; tumultuous action of the heart, with throbbing of the large arteries, though the radial pulse is often weak ; involuntary discharge of urine, fæces, or semen ; and frequently rumbling noises in the intestines, vomiting, or hiccough. The average duration is said to be from $4\frac{1}{2}$ to $5\frac{1}{2}$ minutes, but it may vary from a few seconds to 10 minutes. The clonic spasms are believed to be the result of the stoppage of respiration in the previous stage, with consequent asphyxia.

Stage III.—There is a gradual return of consciousness with cessation of the spasmodic movements. The patient looks around with a bewildered, alarmed, or sad expression, and often attempts to get up or to speak, but some few minutes usually elapse before consciousness is completely restored. The heart still acts vigorously, and the skin is bathed in sweat. Vomiting often takes place. A large quantity of

pale and watery urine may be passed, containing excess of urea and urates, or sometimes of phosphates, and it is said that a trace of sugar has been found after a severe fit. After return to consciousness the patient is usually very exhausted and sleepy, as well as mentally confused, and complains of headache. In many cases, but by no means in all, he falls into a state of heavy sleep or stupor, almost amounting to coma, attended with a stertorous noise in breathing, from which it is difficult or impossible to rouse him, and which lasts for a variable time, sometimes passing into natural sleep. The muscles are relaxed, but present occasional twitchings or slight spasmodic movements. The face generally remains more or less dusky for some time, and the petechiæ continue visible. The patient is often languid and out of sorts for some days after a fit.

The frequency and severity of the fits vary much in different cases. In a good many a tolerably marked periodicity is observed. In few instances does the interval extend beyond a month. The seizures are more frequent as a rule in severe cases, and they tend to increase in both these respects as they advance. Not uncommonly two or more fits occur in succession, followed by a period of freedom from attacks. They are liable to come by night as well as by day.

The general state of the patient also differs considerably. There is rarely perfect health, especially after epilepsy has existed for some time. Many epileptic patients suffer from headache or giddiness and various other symptoms, the general system and digestive organs being also out of condition. The mental faculties become more or less weakened in most cases, and this may end in complete dementia or dangerous mania. Sometimes partial and limited paralysis, twitchings, curious movements, alterations in sensation or in the special senses, and other nervous phenomena are observed. As complications of epileptic fits, coma from injury to the head, apoplexy, or meningitis may arise.

DIAGNOSIS.—The chief conditions from which a true epileptic seizure may have to be distinguished are hysteria; reflex convulsions; epileptiform attacks due to cerebral organic diseases, uræmia, or chronic alcoholism; syncope; and feigned epilepsy. Some of these will be alluded to in a future chapter.

PROGNOSIS.—A cautious opinion should always be given in epilepsy as to the final issue. Very rarely does a fit end fatally, but this might happen from complications. As to the curability or improvement of the disease, the favorable prognostic circumstances are that the disease is recent, or due to some definite cause which can be removed; the patient being very young and a male; absence of hereditary taint; the mind being unaffected; and the fits being frequent. The mental faculties are more liable to become affected in females; in persons who are strong and healthy; when the disease begins late in life; when the fits occur in rapid succession, with attacks of "petit mal;" and, it is said,

when the spasms are not marked during the fit, and there is little or no subsequent coma.

TREATMENT.—1. *During a Fit.*—It is best not to interfere actively in most cases, merely attending to the matters mentioned when speaking of convulsions in general, preventing injury, but not holding the patient forcibly, and putting something between the teeth. If the fit does not soon cease, water may be dashed over the face and chest, and should the seizure be dangerously prolonged, such measures might be had recourse to as the application of sinapisms to various parts; a warm bath, with cold shower while in it; ice to the spine or head; stimulant enemata; electricity; local removal of blood from about the head; or even venesection if there is great danger of asphyxia. After a fit the patient should be placed in a comfortable position, kept quiet, and allowed to sleep.

2. *In the Intervals.*—There are certain principles to be followed in the management of an epileptic patient. *a.* It is requisite to look for and remove any local cause of irritation, such as a foreign body irritating a nerve, or worms. Further, as epilepsy may depend on some central organic mischief, careful investigation is required in order, if possible, to find out and treat any such disease, especially if due to syphilis. Any constitutional condition, as rickets or tuberculosis, must be attended to. *b.* The general management of an epileptic is highly important. He should have a nutritious but light and digestible diet, take moderate daily exercise in the open air; be surrounded by proper hygienic conditions; avoid much mental work, especially in the case of children, who should be kept from school, though if the general health is good, older patients may follow some light occupation; have cold tepid sponging daily, with friction afterwards; check any vicious habits, such as excessive venery, masturbation, or intemperance; and take a sufficient amount of sleep, the head being well raised at night. It is necessary to regulate the digestive functions, especially avoiding constipation, but only using mild aperients. Iron if there is anaemia, quinine, strychnine, and other tonics are often of service. Many epileptics require constant watching, and all need more or less supervision, above all not being allowed to go into positions where they would be in danger from falling, or near a fire or water. Epileptics decidedly ought not to marry.

3. *Specific Treatment.*—Innumerable specifics have been brought forward for the cure of epilepsy. Of these the only drugs that deserve special mention are bromides, especially bromide of potassium; belladonna or atropine; stramonium; conium; extract or tincture of cannabis indica; preparations of zinc, especially the oxide, sulphate in gradually increasing doses up to 10, 15, 20, or more grains twice daily; valerianate, and acetate; nitrate of silver in minute doses; opium in small quantities; and chloroform inhalation, not to induce complete insensibility, but rather systematically employed at certain intervals daily.

or only administered when there are signs of an impending fit. Doubtless all these may prove serviceable in different cases, and sometimes they may be usefully combined, as belladonna with sulphate of zinc. Bromide of potassium has been found eminently beneficial when given in doses of gr. v-xxx or more thrice daily, on an empty stomach. It almost always lessens the number of fits; often keeps them off entirely, though the dose has generally to be gradually increased in order to accomplish this end; and sometimes a complete cure is effected by its use. The bromide is found to be particularly useful when the attacks are chiefly or entirely of the "haut mal" type; when they are very frequent; and when they occur mainly by day. Dr. Chapman treats epilepsy by constant application of ice to the spine. In obstinate cases local removal of blood from the back of the neck, with counter-irritation by blisters, setons, or issues has been recommended. The treatment of epilepsy by clitoridectomy, castration, circumcision, and such methods need only be mentioned to be condemned.

CHAPTER LXXV.

CHOREA—ST. VITUS'S DANCE.

ETIOLOGY AND PATHOLOGY.—Many views have been advanced as to the nature of chorea, but it will not serve any practical purpose to allude to them all.

No characteristic morbid appearances have yet been acknowledged. In a valuable communication recently read before the Medico-Chirurgical Society by Dr. Dickinson, the morbid appearances observed in several fatal cases were described as widely-spread, symmetrical hyperæmia and its consequences, affecting the nervous centres, but especially the ganglia at the base of the brain and the spinal cord, particularly the upper part of the latter and the posterior and lateral portions of its gray matter. The hyperæmia was most marked in the arteries, and its effects became apparent according to the duration of the disease, viz., hæmorrhages, periarterial exudations and degenerations, and spots of sclerosis in chronic cases. To this increased vascularity and its consequences Dr. Dickinson would attribute the phenomena of chorea, localizing the disturbance chiefly in the spinal cord. He considers it as mainly produced by causes belonging to two classes, viz., the rheumatic condition; and various kinds of irritation, mental and reflex, in connection with the nervous system. He regards the lesions as points of irritation, calculated to excite nervous functions unduly, and thus to lead to muscular excitement.

A theory which was first started by Kirkes, and which is supported by H. Jackson, Broadbent, and others, attributes chorea to minute emboli, which are conveyed from deposits on the valves of the heart and become lodged in the small vessels of the convolutions near the corpora striata and optic thalami; or in these centres themselves and other neighboring parts of the brain. Broadbent localizes the mischief in the corpora striata; Jackson in the adjoining convolutions. Bastian regards the plugs as of the nature of thrombi, and as formed of accumulations of white corpuscles. As a consequence there is impaired nutrition of the affected nerve-centres, leading to disturbance but not complete abolition of their functions. The embolic theory is believed especially to apply to those cases in which chorea accompanies acute rheumatism. When this disease attacks the young choreic symptoms are very liable to arise. Occasionally also there are signs of endocarditis or pericarditis along with chorea and high temperature, but no joint-symptoms. It is highly probable, however, that the derangement of the vascular supply and of the nutrition of the nerve ganglia which leads to chorea may result from other causes besides embolism, such as slight local disease or hæmorrhage; disease of the vessels; mental shock; reflex irritation conveyed from some distant part; or an impure state of the blood. Some believe that chorea is due to a certain definite change in the blood, and that the complaint is allied to the acute specific diseases. In many cases anæmia is observed. Apart from rheumatic fever, by far the most frequent *exciting cause* of chorea is sudden fright, especially when acting on a child previously weak and anæmic. The complaint may, however, arise from other forms of emotional disturbance, or from imitation when children associate with others who are suffering from it; injury to the head or to some local nerve; reflex irritation connected with worms; painful second dentition; masturbation; menstrual derangements; or pregnancy. Frequently no obvious cause can be made out, except the condition of the blood and general system.

There are some important *predisposing causes* of chorea, viz. the female sex; early age, especially from 5 to 15; hereditary tendency to various neurosis; bad living and unfavorable hygienic conditions, with consequent imperfect nutrition; a recent attack of some acute lowering illness; and a damp and cold climate. Anomalous choreiform movements may occur at any period of life in connection with various organic cerebral diseases. Certain movements observed in children, and also in adults, are merely the result of habit, such as frequent closure of the eyelids or twitching of the mouth.

SYMPTOMS.—Chorea is characterized by peculiar persistent involuntary movements of various muscles, partaking of the character of clonic spasms; with loss of control over voluntary actions, the will appearing to have its influence over the muscles diminished, while co-ordinating

power is impaired. The complaint generally runs a definite course, though of variable duration, the symptoms setting in gradually; reaching their height in about two or three weeks, at which they remain for a variable time, and then subsiding. Sometimes, however, it remains as a chronic condition. The first signs which attract notice are that the patient seems restless and fidgety, cannot keep quiet, jerks one of the limbs about occasionally, halts or drags one of the legs in walking, makes grimaces, performs various acts awkwardly, or drops and breaks things. The phenomena of the established disease are very characteristic. The term "insanity of the muscles" has been well applied to the absurd, disorderly, involuntary movements which are observed. As a rule they are moderate in intensity and not painful; they exhibit great variety in combination, and are not mere jerks of the muscles, but more like restless movements, indicating complex co-ordinations, and often conveying an idea of purpose or design. The head is moved about in various directions; the face exhibits all sorts of ridiculous smiles, frowns, and grimaces; the tongue is often thrust out and coiled and then withdrawn again, or pushed into the cheek, or drawn into the throat, as if an attempt were being made to swallow it. The shoulders are jerked up and the arms thrown about, while various fidgety movements are carried on with the hands and fingers. The legs are frequently unaffected, being always much less disturbed than the arms. Respiratory movements are infrequent, jerky, and irregular, the natural relations of the abdominal and thoracic movements being perverted during breathing; sometimes there is a dry nervous cough or grunting sound. It does not often happen that the muscles of the trunk seem to be much affected, but choreic patients are usually unable to sit or lie quietly for any time. The muscles of the larynx are rarely implicated, those of the pharynx never. Very commonly these involuntary movements commence, and are more marked on one side than the other; or they may be entirely unilateral—*hemichorea*, or even confined to one limb. They are much intensified by attention being directed to them, as well as under the influence of emotion. A strong effort of the will or a deep inspiration may temporarily control them, but they become worse afterwards. During sleep they cease, but may be excited under the influence of dreams.

The want of control over the voluntary movements is seen in every act which the patient performs, such as walking, holding out the hand, putting anything to the mouth, eating or drinking, smiling, attempting to take hold of or carry any object, which is generally allowed to fall or is thrown down. Articulation is commonly indistinct and jerky. Micturition may be difficult, on account of the jerking of certain muscles. The sphincters are never affected. The muscles are in a state of decided weakness, amounting to slight paralysis. A sense of fatigue and nervous exhaustion is usually experienced; while aching in the limbs, headache,

and pains in the back are often complained of. The expression is said to point to some degree of mental defect, but this is mainly due to the movements of the muscles, though in many cases, especially if of long duration, the intellectual faculties become somewhat obscured.

The general health is almost always below par, anæmia being a prominent feature. Temperature is normal, unless the chorea is associated with some pyrexial condition. The digestive organs are in good order in many cases. The urine is at first usually concentrated and contains excess of urea; frequently deposits urates abundantly, as well as oxalates and phosphates sometimes. The state of the heart requires special consideration. In all cases of chorea it is desirable to examine the heart organ every day if practicable. A basic anæmic murmur may be present, but it is a mitral regurgitant murmur which must be specially looked for. This may be inorganic, resulting from irregular muscular action, or organic, associated with valvular lesion. The former is distinguished by its being usually not very loud or harsh, though it may be well-marked; frequently by its irregularity, being heard at one time and not at another; and by its disappearance as the patient improves. An organic murmur is in many instances evidently connected with an attack of rheumatic endocarditis, but it is important to remember that this may be set up in cases where there is no obvious implication of the joints. Dr. Dickinson has advanced the opinion that endocarditis may be the consequence of chorea, being brought about by the irregular action of the heart.

Cases of chorea are occasionally met with in which the symptoms present an extremely acute and virulent character, the spasmodic movements being excessively violent and constant, and extending throughout the body. The patient is unable to swallow or perform any voluntary act, and is greatly distressed and exhausted, sleep being impossible. Death ensues if the movements do not abate, often preceded by delirious or manic symptoms, delirium, or coma, but the intellect may be clear to the last. Two such fatal cases, occurring in girls about the period of puberty, have come under my notice, and similar attacks have been observed in connection with parturition.

DIAGNOSIS.—The symptoms of well-marked chorea are so characteristic that it is scarcely possible to make a mistake in diagnosis, and therefore no special remarks need be made on this subject.

PROGNOSIS.—Chorea almost always terminates in recovery, except in the severe form alluded to above. No definite opinion as to duration should be given. The circumstances favorable to a speedy recovery are that the disease is due to some condition which is amenable to treatment; that this is commenced at an early period; and that the patient can be placed under proper sanitary conditions. The danger of the development of the cardiac complication should always be borne in mind. Chorea increases the danger from acute rheumatism.

TREATMENT.—It is difficult to estimate the value of remedies in the treatment of chorea, as the complaint so often tends towards spontaneous cure. The indications which should be first attended to are: 1. To get rid of any obvious cause of reflex disturbance. 2. To regulate carefully the diet and the state of the digestive organs, especially maintaining a free action of the bowels. 3. To improve the general health and condition of the blood by nutritious food; proper hygienic conditions; change of air; cold or tepid bathing or the douche, especially over the back, with friction afterwards; and the administration of some preparation of iron, particularly if the patient is anæmic. Many cases do remarkably well under the use of ferruginous preparations, especially the sesquioxide, tincture of sesquichloride, ammonio-citrate, or carbonate. A great many specifics have been introduced for the cure of chorea, the chief including salts of zinc; liquor arsenicalis; tincture of belladonna; conium juice; hydrate of chloral; tincture of cannabis indica; hypophosphites; Calabar bean in the form of powder, extract, or tincture; a combination of morphia with strychnia; or chloroform inhalation twice or thrice daily. From personal experience I do not think that any one of these remedies is applicable to all cases, but one or other may be found of service in different instances. The application of ice to the spine; the passage of a slight constant galvanic current along this region, and subcutaneous injection of curare, are other special modes of treatment which have been advocated. The movements may often be diminished by proper discipline and gymnastic exercises. When the disease is seen in its very early stage, some believe that they can check its course by exciting a free action of the skin by means of warm or hot-air baths, followed by saline medicines or small doses of tartar emetic. Others employ emetics at the outset. Should sleep be much disturbed, some narcotic must be given. If the movements are very severe, it will be well to let the patient sleep on an air- or water-bed. Chorea complicating acute rheumatism usually needs no special treatment. Those dangerous cases in which the movements are extremely violent are but little amenable to any treatment. Inhalation of chloroform; subcutaneous injection of morphia, or perhaps of curare; and supporting the patient, by enemata if necessary, seem to me the most reliable measures.

CHAPTER LXXVI.

TETANUS—LOCKJAW.

ETIOLOGY AND PATHOLOGY.—Though almost always of *traumatic* origin, and therefore occurring in surgical practice, a brief description

of tetanus is needed in this work, as it occasionally comes under the notice of the physician as an *idiopathic* affection, resulting from a person being exposed to cold or wet, sleeping on damp ground, or becoming chilled when perspiring; or attacking infants soon after birth. It is probably a functional disorder of the spinal cord, dependent upon peripheral nerve-irritation, which leads to reflex disturbance. Certain morbid appearances have been described in the cord, but they cannot in the present state of knowledge be said to be at all characteristic.

SYMPTOMS.—The peculiar features of tetanus are persistent tonic spasm or rigidity of the muscles; with extremely painful paroxysms of cramps occurring at intervals. The patient first complains generally of pain and stiffness behind the neck, which increases until the muscles become fixed, the head being drawn back. Then trismus or lock-jaw sets in, and swallowing becomes difficult. Next the rigidity extends to the muscles of the trunk; and finally may involve all the voluntary muscles, except those of the hands, eyeballs, and tongue. They feel hard, tense, knotted, and rigid. The body is generally curved backwards (*opisthotonos*), but may be rigidly stretched out (*orthotonos*), bent forward (*emprosthotonos*), or laterally (*pleurosthotonos*). A very painful feeling of constriction is experienced in the epigastrium, shooting to the back. Soon paroxysms of painful spasms commence, at first slight and occurring at long intervals, but becoming rapidly more frequent, intense, and prolonged, so that they are excited by any slight disturbance, such as a touch or a noise, or come on spontaneously, at last being almost constant. During these fits the patient experiences great distress and suffering; the muscles stand out and become extremely hard, and the back is often so curved that only the head and heels touch the bed; the countenance presents the “*risus sardonicus*,” and has a peculiar aged expression, combined with that of anguish. Breathing is stopped, owing to the fixation of the respiratory muscles, this causing an extreme feeling of oppression and impending suffocation, but the act is comparatively free in the intervals. The voice is weak. During the attacks there is much heat and sweating, and the pulse is very frequent and small. Soon it becomes impossible for the patient to swallow anything, though often very hungry and thirsty, while the mouth is clogged with viscid mucus. Sleep is entirely prevented. There are no head-symptoms, and the intellect remains undisturbed. The pupils are dilated. Cutaneous sensation is not affected, but there is increased reflex excitability. The power over the sphincters is retained; constipation is generally present; and micturition is often difficult. Death is a very frequent termination, either from a sudden or gradual apnoea; asthenia from exhaustion and want of support; or both causes combined. The temperature in many cases rises to a very high degree before death, and continues to ascend after death. Recovery occasionally takes place, but convalescence is very slow. Temporary

remissions not uncommonly occur, which are apt to mislead as to the ultimate issue. Tetanus now and then assumes a somewhat chronic course. It is usually less acute in its progress when idiopathic than when traumatic.

DIAGNOSIS.—Strychnine-poisoning is the chief condition with which tetanus is likely to be confounded; for the distinctions reference must be made to toxicological works. It might possibly be mistaken for hydrophobia; acute spinal meningitis; or certain cases of hysteria.

PROGNOSIS is extremely grave, as may be gathered from what has been previously stated, but the disease is not necessarily fatal.

TREATMENT.—The only measures which seem to me of any service in idiopathic tetanus are to use warm, vapor, or hot-air baths freely; to administer subcutaneous injections, either of morphia, curare, or nicotine; to relieve the spasms by inhalation of chloroform; and to support the patient by liquid nourishment and stimulants, administered in the form of enemata when they cannot be swallowed. All sources of disturbance must be removed, and the patient kept perfectly quiet. Ice to the spine has been recommended, but in one case which came under my observation no good effects whatever resulted from its employment.

CHAPTER LXXVII.

ALCOHOLISM.

ETIOLOGY.—The injurious effects upon the system of alcoholic abuse are but too well known. They are the result of its direct irritant action; its influence on the vaso-motor nerves; the circulation of its own poisonous elements, or those derived from its decomposition, through the various organs and tissues; and its interference with tissue-metamorphosis, oxygenation, and nutrition. The exact effects will depend on the nature, quantity, and strength of the stimulant indulged in. Spirits do by far the greatest harm, especially when taken in frequent drams, strong, and on an empty stomach. Alcoholism is most frequent in males; and in those who from their occupation are exposed to intemperance, as draymen, potmen, or cabmen, or whose calling is a lonely or sedentary one. It is also predisposed to by various conditions which depress the nervous energy, such as working or sleeping in a hot vitiated atmosphere; excessive mental work; anxiety or worry; or excessive venery. Persons who suffer severe pain and hysterical individuals are very likely subjects to drink to excess. In not a few instances there seems to be a hereditary tendency to alcoholism, or to some neurosis, such as epilepsy or mania.

SYMPTOMS.—Cases of alcoholism may be included under the following groups: 1. Acute alcoholic poisoning, the symptoms being those of narcotic poisoning. 2. Delirium tremens. 3. Chronic alcoholism. 4. Acute mania, in which the patient is extremely violent and dangerous and has a fixed delusion. 5. Acute melancholia, with suicidal tendency. 6. Oinomania, where there is a constant craving for drink, which breaks out at intervals into an uncontrollable propensity, the moral sense being entirely dead, so that the subjects of this condition will do anything to obtain drink. Only delirium tremens and chronic alcoholism can be specially considered here.

DELIRIUM TREMENS.—This condition may come on under the following circumstances: 1. From mere excessive drinking in a temperate person. 2. An individual who is accustomed to drink freely gets very drunk. 3. A habitual tippler who, without being actually drunk, is always more or less fuddled from saturation with alcohol, experiences some slight disturbance, especially of traumatic kind; or delirium tremens may arise in such persons even without any apparent cause. 4. From deprivation of proper food, with moderate indulgence in stimulants. 5. In consequence of suddenly cutting off stimulants from an individual who has been accustomed to drink freely, especially if old or debilitated. 6. As the result of inhalation of fumes from a distillery. it is said (?). Most cases of delirium tremens follow abuse of spirits.

Generally there are premonitory indications, especially disturbed sleep or absolute insomnia; general discomfort and feebleness; agitation and tremulousness; mental confusion and inability to fix the attention; timidity and lowness of spirits. The alimentary canal is commonly disordered, as evidenced by anorexia, foul tongue and breath, unpleasant taste, and constipation with unhealthy stools.

The actual symptoms of delirium tremens are usually very characteristic. The patient is quite sleepless or only obtains short uneasy dozes. The mind is in a state of general confusion, restlessness, and excitement, and though it may be possible to attract the attention of the patient for a moment, and to obtain a sensible answer to a question, he speedily wanders off and talks ramblingly and incoherently, there being a kind of busy delirium. A variety of mental delusions, illusions, and hallucinations usually exist, the patient fancying he sees or hears all sorts of objects and sounds, often of a hideous character; or distorting in his imagination what he does see and hear into strange and horrible forms and noises. These delusions are generally transient and changeable, but occasionally the patient fixes upon one and reasons about it. Further, the mental condition is one of combined irritability, marked cowardice, sense of dread, and suspicion. The patient has an anxious wandering expression, and looks upon everybody around with terror and distrust, imagining that they are trying to poison or otherwise injure him; or fears lest he may do an injury to himself, and has a great

sense of alarm as to what is going to happen. These feelings may culminate in fits of violent mania, attended with extreme muscular effort and a wild expression, the patient trying to injure those around, to jump out of the window, or do various other acts with the view of escaping from some imaginary enemy. There is usually no complaint with reference to the head. Creeping sensations over the skin and other paræsthesiæ are common, and the patient often fancies he sees or feels horrible insects crawling over him. The prominent symptoms connected with the muscular system are restlessness, carphology, and general tremors, the latter being especially observed in the hands and tongue. After fits of violence the patient is much exhausted and prostrated. The pupils are generally dilated and sluggish.

The important extrinsic symptoms are profuse perspiration without fever, the sweat having often a very disagreeable smell, the skin feeling moist and clammy, especially that of the palms, or being even drenched; a weak, large and soft, or small and frequent pulse, the sphymographic tracing often exhibiting marked dirotism; and disorder of the alimentary canal, as indicated by foulness of the mouth and tongue, which are covered with sticky mucus, peculiarly unpleasant breath, complete loss of appetite, much thirst, nausea but rarely vomiting, and constipation, with offensive stools. The urine is sometimes much diminished in quantity, and is deficient in phosphates and urea, but often deposits urates on standing.

Recovery is in many cases preceded by restoration of sleep, but this by no means necessarily leads to a favorable termination. In fatal cases typhoid symptoms frequently set in, with a dry brown tongue, sordes on the teeth, and low nervous phenomena, such as muttering delirium, epileptiform convulsions, and coma. Pneumonia or some other inflammatory complication may arise. Sometimes death results from sudden collapse.

CHRONIC ALCOHOLISM.—Various grades of this condition are to be constantly seen, especially in hospital practice. A very able description of the phenomena observed has been given by Anstie. The ordinary signs may be summed up as follows: 1. Nervous phenomena. These include muscular restlessness and fidgetiness, culminating in tremors, beginning in the limbs, at first slight and controlled by an effort of the will, but afterwards becoming more marked and constant, worse in the mornings, and then diminished by food and drink; insomnia, or very disturbed and unrefreshing sleep with horrible dreams; diffused dull pain or heaviness in the head, and sudden attacks of vertigo; disorder of the special senses, as evidenced by photopsia or muscæ volitantes, and noises in the ears; mental disturbance, indicated in the early period by mental disquietude, uncertainty of purpose and inability to fix the attention upon anything, indecision of character, a vague sense of dread, or fits of violent temper; later on by impairment of the

mental faculties, in some cases very marked, the patient having hallucinations or delusions as to people plotting his ruin, and exhibiting great cowardice with loss of moral power, and a particular tendency to falsehoods about drink; impairment of muscular co-ordination, which explains the sensation sometimes experienced by the patient, as if he were going to fall down a precipice when walking on firm ground. General appearance. The signs coming under this head are more or less obesity or emaciation, the former being chiefly observed in brandy drinkers, the latter, which may be extreme, in spirit drinkers; flabbiness or a bloated aspect of the features, with red and watery eyes, yellowness of the conjunctiva from fat or jaundice, and often redness of the face with enlarged vessels, especially about the nose and cheeks, and acne. 3. Disorder of the alimentary canal, indicated by total anorexia or disgust for food, especially in the mornings, the patient often making this an excuse for taking stimulants, in order to "keep up" the system; thick dirty furring of the tongue as a rule, but not always; dryness and cracking of the lips; catarrh of the pharynx; peculiar and disgusting foulness of the breath; severe morning nausea or actual sickness; irregularity of the bowels, with fetid stools; occasionally serious hæmorrhage from the stomach or bowels. 4. Symptoms due to organic visceral changes and to degenerations. These have been pointed out in the previous chapters, and, as already stated, there is much difference of opinion as to the influence of alcohol in their production. There can be no doubt as to the direct effect of strong spirits upon the mucous membrane of the alimentary canal, and especially that of the stomach, these inducing congestion, chronic inflammation, fibroid changes, and glandular degeneration; or that alcoholic abuse tends to lead to fibroid and fatty degeneration, with atrophy of various organs and tissues, including the nerve-centres.

In very advanced cases of chronic alcoholism still more grave nervous symptoms are met with, such as absolute dementia; marked sensory paralysis in different parts; extreme muscular trembling, simulating sensory paralysis agitans; general muscular weakness; paralysis or ataxia; epileptiform attacks; or finally coma. Such phenomena must be attended with serious organic changes in the nervous system.

DIAGNOSIS.—Delirium tremens has to be mainly distinguished from acute mania or meningitis. The circumstances under which it occurs, the characters of the nervous and extrinsic symptoms; and absence of any fixed delusion, generally leave no doubt as to the nature of the case. Sometimes acute alcoholism closely simulates low fevers. Chronic alcoholism should be always suspected if any of the symptoms mentioned are complained of, not forgetting digestive disorders, but especially should there be morning sickness, insomnia, fidgetiness or tremor, mental restlessness, or disturbance of the special senses. Close inquiry is often needed in order to elicit a history of intemperance in the

cases, many patients trying to conceal their evil habits in every possible way. Anstie enumerates the following nervous diseases as being particularly liable to be simulated by chronic alcoholism, viz., commencing general paralysis of the insane; paralysis agitans; lead-poisoning; locomotor ataxy; softening of the brain or cord; epilepsy; senile dementia; hysteria; and the nervous malaise associated with some forms of dyspepsia.

PROGNOSIS.—Delirium tremens usually terminates favorably. The chief unfavorable circumstances are: Chronic indulgence in excess of alcohol, so that the system is more or less saturated; the patient being advanced in years, enfeebled in constitution, or suffering from organic visceral disease, especially disease of the kidneys; a history of previous attacks, particularly if numerous; difficulty in getting nourishment into the system, either from the patient refusing food, or from assimilation being impaired; inability to procure sleep before the patient is much exhausted; an unfavorable condition of the pulse, as evidenced by the sphygmograph; the occurrence of typhoid or low nervous symptoms; and the development of inflammatory complications, especially pneumonia. In the early period chronic alcoholism can always be cured if the patients will keep away from drink, but it is often a very difficult matter to get them to do this. When serious nervous symptoms have become developed there is but little hope of improvement.

TREATMENT.—In treating delirium tremens, the first object ought to be to withdraw or reduce the quantity of all forms of alcoholic stimulant, so far as this is practicable, but especially spirits and wine. In a large proportion of cases it has been found that no harm whatever results from cutting off stimulants completely, especially in young patients and in first attacks; in others they must be moderated as much as possible, being chiefly needed if the patient is a habitual drunkard, old, or feeble, or if there are signs of adynamia. It is well to keep to malt liquors, if it can be managed, but brandy may be required. At the same time it is highly important to introduce as much nourishment as possible into the system. Strong beef tea, beef-juice, hot soups, milk, eggs beaten up, and other forms of nutritious food which are readily assimilated must be given at frequent intervals, by night as well as by day. If the patient refuses food, white of egg mixed with iced water is useful, and nutrient enemata must be regularly employed. In the treatment of strong patients, especially if they are young and a large quantity of spirits has been taken, a brisk watery purgative is decidedly beneficial at the outset, but this is not advisable in all cases.

The next indication is to endeavor to procure sleep before the patient is exhausted. For this purpose certain drugs are most useful when employed in moderate doses, especially opium or morphia, the latter being best introduced by hypodermic injection (gr. $\frac{1}{8}$ to $\frac{1}{2}$); hydrate of chloral (gr. xx every hour or two); bromide of potassium (gr. xx every

two hours); and extract or tincture of *cannabis indica*. As a general rule I quite agree with Anstie and others in opposing the notion that "patients in delirium tremens require to be narcotized into a state of repose," but I have met with cases in which the only chance of recovery seemed to be in procuring sleep at any risk, and where the administration of considerable doses of morphia, combined with abundant nourishment, proved, I believe, the means of saving life. Other remedies employed in the treatment of delirium tremens are tincture of digitalis in large doses (3ij to 3i every four hours), originally introduced by Mr. Jones of Jersey; powdered capsicum or the tincture in full doses; tartar emetic in sthenic cases attended with wild delirium; and chloroform, either by inhalation or internally. Chloroform inhalation is fully employed may be decidedly serviceable sometimes.

Symptoms often require attention in acute alcoholism, especially vomiting. Should there be adynamic signs, stimulants must be given, as ammonia, ether, musk, or camphor, along with brandy. Complications may call for interference, particularly pneumonia, which always needs a supporting treatment in these cases. A patient suffering from delirium tremens should be placed in a comfortable and well-ventilated room; kept perfectly quiet and apart from friends, only one or two trained attendants being permitted to be present, according as the patient is peaceable or violent; treated kindly but with firmness; and constantly watched, lest he should injure himself. Mechanical restraint, such as by means of the strait-waistcoat, is but rarely admissible, though it is needed now and then in cases of extreme violence.

In treating chronic alcoholism, there should in most cases be no abstinence in forbidding stimulants entirely, but especially spirits or wine. It is often, however, difficult to persuade patients to carry out this advice. A glass of good bitter ale or stout along with food may be useful in some instances, and Anstie recommended the latter at night in order to procure sleep. It is most important to induce the patient to take nourishment, and as there is generally a great distaste for food, small quantities of milk, concentrated beef tea, soups, or meat-juice should be given at frequent intervals. It is wonderful, however, how soon the appetite returns in many of these cases when the intemperate habits are relinquished. If there is much sickness, an effervescent mixture may be given, or soda-water with milk. I have found a mixture containing bicarbonate of soda or nitro-muriatic acid with infusion of gentian and three or four minims of hydrocyanic acid very serviceable in many cases. Anstie recommended one or two grains of quinine twice or thrice daily. Marcet found oxide of zinc useful, beginning with two grains twice daily, and gradually increasing the dose. Others give tincture of capsicum. If there is much restlessness and sleeplessness, a full dose of bromide of potassium at night will generally procure sleep, or this drug may be given more frequently if necessary. Some

prefer subcutaneous injection of morphia; hydrate of chloral; extract of cannabis indica; or a full dose of sulphuric ether. Baths are often serviceable in chronic alcoholism; and rest from occupation, with change of air, aids recovery materially. The bowels should be kept well opened.

In advanced cases the treatment must be varied according to the prominent symptoms present. Anstie found the long-continued use of good doses of cod-liver oil most beneficial, with hypophosphites of soda or lime if there is commencing paralysis of sensation; bromide of potassium should there be epileptiform convulsions; and very minute doses of strychnine when marked muscular tremor is observed.

CHAPTER LXXVIII.

ON CERTAIN FORMS OF METALLIC POISONING.

I. LEAD-POISONING—SATURNISM.

ETIOLOGY.—The introduction of lead into the system is most important in connection with certain occupations in which this metal is used, saturnism being especially common among painters, plumbers, and workers in white-lead. Sometimes it acts as a poison through being taken in water kept in leaden cisterns, in cider, in adulterated articles, or medicinally; it may be inhaled from fresh paint, and now and then gains access into the body in curious ways, as from using adulterated snuff, or rubbing the ointment into the skin. As a rule the metal is either swallowed or inhaled, and often enters the system by both these channels. It becomes in time deposited in the various organs and tissues, but especially in the muscles, nerves, and nerve-centres, impairing their nutrition, the muscles becoming the seat of marked fatty degeneration and atrophy.

SYMPTOMS.—Certain objective appearances are usually very obvious in connection with chronic saturnism, viz., the so-called blue line on the gums at their junction with the teeth; a dirty brown or black incrustation of the latter, if they are not cleaned, with rapid tendency to decay; more or less emaciation, with a dry harsh skin, and a peculiar sallow, pale, or yellowish tint of countenance, with yellowness of the conjunctivæ. The breath is generally offensive, and a sweetish taste is frequently experienced. In some cases the pulse is very infrequent and slow. The prominent clinical phenomena which may be associated with lead-poisoning may be summed up thus: 1. Lead-colic, having the characters of more or less severe intestinal colic, accompanied usually

with a retracted abdomen ; absolute constipation ; nausea and vomiting ; eructations and hiccough. 2. Disorders of sensation, such as hyperæsthesia or hypæsthesia of different parts, numbness, formication, neuralgic pains, aching in the limbs and joints, and headache. 3. Amaurosis, either single or double, usually associated with other grave nervous symptoms, and accompanied with changes visible to the ophthalmoscope. 4. Motor disturbance, in the way of tremors, epileptiform convulsions, or local paralysis. The most common and important variety of paralysis is that of the extensors of the forearm, giving rise to "wrist-drop;" the upper limbs are, however, often affected more or less throughout, and the legs also in many cases, as well as muscles in other parts. As a rule both forearms are implicated, but not equally. The muscles are generally considerably wasted, giving rise to a depression on the back of the forearm, and those of the hands may also be much atrophied, so as to make them assume the crow-foot shape. Sometimes they are strongly closed, as if the flexor muscles were rigid. The condition of electric contractility and sensibility has been already considered. The predisposing influence of lead in the system with reference to gout has been alluded to in connection with that disease.

TREATMENT.—Preventive measures are most important in the case of those working with lead. They should be very particular as to cleanliness, especially in washing their hands and cleaning their nails before eating, and in cleansing their lips and teeth. Every precaution should be taken against inhaling particles of lead. I believe a good deal of the metal is often introduced during meals, and the practice of taking a little dilute sulphuric acid in water at this time may be useful, as this would form an insoluble compound with any lead entering the stomach. The bowels must always be kept well opened. If there is any lead in the system iodide of potassium may be given from time to time. Lead-colic must be treated in the same way as other forms of intestinal colic. The great remedy for getting the metal out of the system, which is the main object to be aimed at in all cases, is iodide of potassium, a soluble iodide of lead being formed, which passes away in the urine and other excretions. It must be given for a long time. Sulphur baths are also said to be useful. Paralysis, neuralgic pains, and other nervous symptoms must be treated according to the principles previously laid down.

II. MERCURIAL POISONING.

Individuals who work with mercury are liable to peculiar tremors from the inhalation of this metal, and these have also occasionally followed its medicinal employment. There are the usual signs of mercurialization in connection with the mouth and general system. The tremors almost always begin in the upper limbs, being accompanied with numbness or formication and pains in the joints, but may after-

wards extend to the legs, trunk, face, tongue, and respiratory muscles; in short, to all except those of the eyeballs. At first the movements are but slight, but afterwards increase so as to be spasmodic or convulsive, voluntary acts being performed in a violently jerking or spasmodic manner. They are greatly increased by any mental excitement. Finally more or less trembling becomes constant, and the patient is rendered quite helpless as to voluntary movements, speech and breathing being also gravely affected. In most cases the tremors subside if the patient is supported in a sitting or recumbent posture, and they also cease during sleep. Stimulants diminish them temporarily, but they are worse afterwards. The tremulous muscles are decidedly weak. In very advanced cases serious nervous symptoms arise, such as sleeplessness, delirium, coma, or epileptiform convulsions.

TREATMENT.—As soon as any of the symptoms described appear, the patient should immediately give up his occupation for a time. For the elimination of the mercury the chief remedies are warm, vapor, or sulphur baths, sulphur or iodide of potassium internally, and purgatives; medicinal diaphoretics and diuretics may also be employed. For the nervous symptoms quinine, iron, opium, nitrate of silver, and galvanism are recommended.

CHAPTER LXXIX.

SUNSTROKE—INSOLATION—COUP DE SOLEIL.

ETIOLOGY.—Long-continued exposure to the direct and powerful heat of the sun often gives rise to grave nervous symptoms. These are chiefly met with in soldiers, and of course cases of sunstroke are by far most frequent in tropical climates, but several have occurred in this country during late years. There are certain powerful predisposing causes, viz., wearing heavy or tight clothing and accoutrements; physical fatigue and exhaustion; the state of system induced by overcrowding and bad ventilation; and deficiency of drinking-water. Most authorities are of opinion that a moist atmosphere is worse than a dry one. The immediate cause of sunstroke is believed to be interference with evaporation and radiation from the skin, so that the blood gets overheated, and thus exerts an injurious and depressing effect upon the nerve-centres.

ANATOMICAL CHARACTERS.—The only post-mortem appearances are fluidity of the blood, some congestion of the brain generally, and extreme pulmonary congestion, with distension of the right heart.

SYMPTOMS.—Generally there are premonitory symptoms, viz., great

heat and dryness of the skin, with a subjective feeling of burning or stinging, the temperature being often hyperpyrexial; marked debility and sense of exhaustion; thirst and nausea; vertigo, but not often headache; conjunctival redness; frequent desire to micturate; and sometimes delirium or delusions. Dr. Muirhead describes three varieties of the actual attack—*cardiac*, *cerebro-spinal*, and *mixed*. In the first there is sudden syncope, often terminating in speedy death. The cerebro-spinal form is characterized by coma; hurried, labored, noisy, or stertorous breathing; contracted and immovable pupils; reddened conjunctivæ; convulsions in many cases; tumultuous action of the heart, with a very rapid, and in a short time feeble, compressible, and irregular pulse. The temperature may reach 112° or more, and continues to rise after death in fatal cases. Should recovery take place, sequelæ are liable to be left, such as constant headache, mental disturbances, choreiform movements, or a tendency to epileptiform attacks.

TREATMENT.—Attention should be at once paid to any premonitory symptoms of sunstroke. As a rule the great remedy is the assiduous use of the cold douche over the head, neck, and chest, many repetitions of which may be required, but care is necessary in its employment. It helps to lower the temperature and restore the breathing. The wet sheet with constant fanning, enemata of iced water, and application of ice to the shaven head and spine are also recommended. The patient should drink freely if he is conscious. If coma persists, a blister may be applied to the nape of the neck or to the shaven scalp. The bowels should be freely opened by enemata. The patient must be properly supported by nutriment and stimulants, and medicinal stimulants may be useful, especially in syncopal cases. Inhalation of chloroform is recommended for the relief of severe convulsions.

CHAPTER LXXX.

DISEASES OF THE BRAIN AND ITS MEMBRANES.

CLINICAL CHARACTERS.—Before proceeding to describe cerebral diseases, it will be well to give a summary of the special clinical phenomena which point to the portion of the nervous system, and they may be stated generally as: 1. Morbid sensations in the head. 2. Mental disturbance. 3. Subjective disorders of the special senses. 4. Signs of irritation or paralysis of the cranial nerves. 5. Sensory and motor derangements in the limbs and trunk, usually unilateral, occasionally of general distribution, sensation, however, being as a rule much less affected than motion. 6. Physical alterations about the head in some cases. 7. Objective changes in the eyes, as seen by the ophthalmoscope. 8. Certain extrinsic symptoms, especially vomiting and obstinate constipation. In some conditions respiration and circulation are much affected; and in exceptional instances peculiar phenomena are observed.

The precise symptoms in any particular case of brain disease, however, vary very widely, both in their nature and degree, according to the rapidity with which the mischief is set up; the seat, extent, and number of distinct centres of lesion; and the effects produced on surrounding parts. So far as is practicable the clinical variations thus occasioned will be pointed out in the following chapters, but for fuller information reference must be made to the special writings of Hughlings Jackson, Ferrier, Brown-Sequard, Lockhart Clarke, Ogle, and others.

ACUTE CEREBRAL INFLAMMATIONS.

I. SIMPLE OR PRIMARY MENINGITIS.

ETIOLOGY.—The *exciting causes* of simple meningitis are: 1. Direct injury to the membranes, especially from fractures of the skull. 2. Disease of the cranial bones, particularly of the temporal in connection with ear affections. 3. Prolonged direct exposure to the sun. 4. Excessive mental labor. 5. Erysipelas of the head and face. 6. Local irritation from adventitious growths, etc. 7. It is said exposure to cold and wet. 8. Certain acute exanthemata in rare instances. 9. Sudden disappearance of chronic cutaneous eruptions (?). Inflammation of the cerebral membranes is also a part of cerebro-spinal fever, and may result from extension upwards of spinal meningitis. The disease is most frequently met with in male adults. A hot climate and season; undue mental work, especially if combined with loss of sleep; a weak and exhausted condition of the system from previous illness or any other cause; intemperate habits; and the presence of Bright's disease, are regarded as *predisposing causes*.

ANATOMICAL CHARACTERS.—As a rule acute simple meningitis involves the membranes extensively, but is most marked over the convexity of the cerebral hemispheres. It may, however, be localized, or be evident chiefly or solely about the base. The dura mater does not often present any particular change, unless it is locally affected from injury or bone-disease, when it may be reddened, black and sloughy, or unusually adherent; occasionally exudation or pus collects between it and the bone. Sometimes, also, inflammation is set up in the venous sinuses, leading to the formation of a thrombus, which may soften into a purulent-looking fluid, and give rise to embolism and blood-poisoning. Generally the cerebral arachnoid appears dry and parchment-like, and more or less opalescent or opaque; sometimes it presents over its surface a thin layer of exudation or pus. The pia mater is extremely red and vascular, more so in some parts than others, while frequently small extravasations are observed, with patches of opacity around. In the early period a small quantity of serum, clear or more generally turbid and flocculent, and sometimes bloodstained, is seen in the arachnoid sac and in the meshes of the pia mater. More commonly there is little or no fluid, but a soft, yellowish, opaque exudation, often more or less purulent-looking, covers the surface, being particularly

abundant in the sulci between the convolutions, and along the larger vessels. When the inflammation affects the base the exudation involves some of the cranial nerves. The brain frequently presents an inflammatory condition of the superficial layer of its gray matter, especially in prolonged cases, indicated by redness, softening, and adhesion to the pia mater. The ventricles are normal in many cases, but may contain excess of serum or pus, or have the walls covered with exudation.

SYMPTOMS.—Acute meningitis is usually preceded by premonitory symptoms, such as increasing headache or a sense of heaviness; vertigo; disturbances of general sensation or of the special senses; irritability, with a feeling of depression and restlessness, or sickness. The attack is usually directly ushered in by a marked rigor or feeling of chilliness, speedily followed by pyrexia and severe headache, with cerebral vomiting. In exceptional instances the first symptoms are epileptiform convulsions, hemiplegia, aphasia, or stupor ending in coma. The clinical phenomena of the established disease are divided into certain stages, as follows:

I. Stage of Excitement.—At this time the symptoms may be arranged thus: *a. Local.*—Intense and constant headache, in most cases chiefly frontal, of a tight or binding character, with sudden darting or plunging exacerbations, which may be so violent as to elicit sharp cries or shrieks, the pain being increased by any slight disturbance, as movement, noise, or light; marked vertigo; great heat of head, with flushing or alternate flushing and pallor of the face, and conjunctival injection. *b. Mental.*—Great irritability and unwillingness to be disturbed, with sleeplessness, culminating speedily in delirium, almost always of an active character, not uncommonly being almost maniacal. The expression being wild, staring, and savage, or sometimes indicating great terror, and the patient shrieking and gesticulating, or being very violent. Occasionally the delirium is more of a muttering kind. *c. Sensorial.*—General hyperæsthesia; tingling or formication in various parts; diplopia or dim vision, marked photophobia, photopsia or muscæ volitantes; tinnitus aurium and undue sensibility to sound. *d. Motor.*—General restlessness and jactitation; twitchings or spasmodic movements in various muscles, especially those of the face and limbs, either unilateral or bilateral; or sometimes general convulsive movements, rigidity, tetanic spasms, local or hemiplegic spasms. Slight strabismus is usually observed, and it may be very evident, while the eyeballs move about convulsively or stare fixedly. The pupils are very variable, but most frequently contracted or oscillating. *e. Extrinsic.*—There is marked pyrexia, without prostration, the skin being very hot and dry; the temperature considerably raised; the pulse remarkably frequent, hard, and sharp; the tongue white and the mouth clammy, with great thirst and loss of appetite. Cerebral vomiting is a prominent symp-

tom, and also constipation as a rule, the stools being offensive and dark. Breathing is generally irregular and moaning. The duration of this stage may vary from one to fourteen days or more.

II. *Stage of Transition*.—This is characterized by the cessation of the symptoms of excitement just described, with the development of those indicating failure of the cerebral functions, and there may be a remarkable improvement at its commencement. Generally the change is more or less gradual, but may be very rapid, a sudden fit of convulsions occasionally ushering in the final stage. As a rule the headache, delirium, exalted sensations, and fever subside; while there is a tendency to heaviness, somnolence, or muttering stupor ending in coma, with cutaneous hypæsthesia or anæsthesia, and impairment of sight and hearing. Motor disturbances become more prominent and general, in the way of carphology, subsultus tendinum, twitchings or tremors, spasmodic movements or convulsions, or paralysis. The pupils become dilated and motionless. The body and limbs cool down considerably, though the head may still remain hot; the pulse is less frequent, but very variable, and sometimes intermittent; the tongue tends to become dry and brown. Respiration is irregular and sighing. Urine is retained and may overflow. These symptoms culminate in:

Stage III, in which there is complete abolition of the cerebral functions, as shown by absolute coma with stertorous breathing; general anæsthesia, with muscular paralysis and relaxation; great dilatation and immobility of the pupils; and involuntary escape of fæces and urine. The patient presents an aspect of extreme prostration and adynamia, the features being sunken and ghastly, the surface bedewed with cold clammy sweats, the tongue dry and brown, the teeth and gums covered with sordes, while the pulse is excessively rapid, thready, and fluttering. In this condition the patient sinks more or less speedily.

Differences are observed in the symptoms according to the seat and extent of the inflammation. If it affects only one hemisphere there may be hemiplegia. If it is localized, the symptoms are correspondingly limited. When the base is most affected it is said that the pain is more suborbital and suboccipital; the mental and sensorial excitement is less marked, delirium being comparatively slight and transient; special paralysis of some of the cranial nerves is observed; while coma sets in early and speedily becomes profound. Ophthalmoscopic signs are evident when the inflammation is conveniently situated, viz., those of neuritis or ischæmia. Hyperæmia is commonly present.

Local inflammation of the dura mater, due to injury or bone disease, is generally very obscure in its clinical history. The symptoms which may indicate this condition are pain, at first localized, being often seated behind the ear, but gradually extending over the head; local tenderness over this part sometimes, or painful œdema; little or no cerebral disturbance at first, but in course of time gradual somnolence

ending in coma, or sometimes delirium and convulsions; rigors, which may be periodically repeated, with pyrexia; diminished fullness of jugular vein on the same side, if a thrombus forms; and signs of pyæmia and embolic deposits in other parts.

II. TUBERCULAR MENINGITIS—ACUTE HYDROCEPHALUS.

ETIOLOGY.—This variety of meningitis is immediately due to local irritation set up by tubercles. Therefore all causes predisposing to tuberculosis may be considered as predisposing to tubercular meningitis, and where a hereditary tendency exists, whatever leads to local excitement in connection with the brain, as unduly forcing the mental faculties in young children, tends to give rise to the formation of tubercles here. Children are by far the most frequent subjects of tubercular meningitis, especially from two to ten years of age, but it may be met with from earliest infancy to old age, and is not uncommon up to the time of puberty and in young adults. Hereditary predisposition may be traced in a large majority of cases. This complaint not unfrequently follows one of the exanthemata.

ANATOMICAL CHARACTERS.—Miliary tubercles are found in greater or less abundance in the meshes of the pia mater, often adhering to the under surface of the arachnoid. They are frequently whitish or opaque, or may be softened and yellowish in the centre. They appear scattered all over the surface, but are principally seen about the base of the cerebrum; in the fissures, especially the fissure of Sylvius, and along the chief branches of vessels. The membranes are injected, especially the pia mater. The surface of the arachnoid feels sticky, and a thin layer of soft lymph or puriform matter can often be scraped off; this substance usually collects in abundance between the arachnoid and pia mater, especially about the base and in the fissures. The pia mater is thickened, and its meshes are infiltrated with the same material or with serum. As a rule there is little or no fluid in the arachnoid sac. Occasionally the signs of inflammation are chiefly observed on the convexity. The ventricles of the brain generally contain a considerable quantity of colorless, usually somewhat turbid and flocculent serum, often amounting to some ounces in each lateral ventricle. This leads to œdema, maceration, and softening of the surrounding brain structures; dilatation of the spaces and their communicating channels, as well as frequently to compression of the convolutions of the cerebrum against the skull, so that they appear flattened and pale. Sometimes when the dura mater is opened the brain gives way, and the serum escapes. The walls of the ventricles are generally covered more or less with fine granulations. The exact appearances vary considerably in different cases; in some the signs of meningeal inflammation are more prominent; in others the quantity of fluid in the ventricles is more striking. There is no proportion between the amount of tubercle

of the products of inflammation. Tubercle is generally present in other structures, sometimes in the brain itself.

SYMPTOMS.—Tubercular meningitis in children is generally preceded for a variable period by those premonitory symptoms previously described as being observed in connection with tuberculosis; while nervous symptoms are often prominent, as fretfulness, drowsiness, sudden starting, screaming, grinding of the teeth during sleep, headache, vertigo, or a staggering gait. They may, however, be entirely absent; while in some cases the disease supervenes on long-standing tubercular mischief in other parts. The symptoms of the established disease are described as following certain stages, and these have been differently classified by different writers. Certainly they are often very indistinctly marked in practice, and cases present considerable variety in their clinical history. The meningitis may be very obscurely indicated, being but a part of general acute tuberculosis; or its special symptoms may be those which attract attention. The characteristic phenomena are usually those of basic meningitis, with general cerebral excitement; followed by total abolition of the cerebral faculties, owing to the pressure of the fluid.

The invasion is in most cases more or less gradual, and not infrequently very insidious. Sometimes the disease sets in very rapidly or suddenly. The chief invasion symptoms which may be met with are severe vomiting; intense headache; rigors, followed by pyrexia; marked irritability, nervousness, and obstinacy or unreasonableness in behavior; or drowsiness. Occasionally tubercular meningitis is revealed by sudden convulsions, delirium, coma, or paralysis.

The ordinary clinical history of the developed disease is more or less as follows: The early symptoms are severe constant headache, generally frontal, increased by movement, light, or noise, with intense darting paroxysms, causing the child to scream or cry out, and to hold the head; vertigo, giving rise to staggering and a tendency to cling to surrounding objects; alternate flushing and pallor of the face, the expression being often frowning or sad, or sometimes vacant and stupid; heat of head; marked intolerance of light and sound; general hyperæsthesia or dysesthesia; great irritability and peevishness, with unwillingness to be disturbed, to answer questions, or take food; insomnia or very disturbed sleep; sometimes slight wandering at night, but no marked delirium; unsteady gait, with dragging of the limbs; constant restlessness; grinding of the teeth; alternate contraction and dilatation of the pupils; severe vomiting; usually obstinate constipation and retraction of the abdomen; complete anorexia, without any particular thirst, the tongue being furred, and the breath offensive; moderate but irregular pyrexia, the temperature not often rising above 101° or 102° in the evenings, the skin being usually harsh and dry, the pulse rather frequent, but easily hurried to 120 or more, and the urine concentrated,

but very deficient in chlorides, phosphates, and urea. Subsequently the mental faculties are more disturbed, as evidenced by delirium in some cases, either wild and restless or muttering, and increasing drowsiness, with tendency to stupor. General sensibility becomes impaired, and the hyperæsthesia of the special senses ceases, while signs are developed of implication of the cranial nerves at the base of the brain, such as dim or double vision or hemiopia; tinnitus aurium and partial deafness; twitchings about the face; strabismus; oscillation of one or both eyeballs; dilatation, inequality, or marked oscillation of the pupils, these being not very sensitive to light. The face assumes a worn, aged, distressed expression, the eyes being half closed. Vomiting ceases, and diarrhoea may set in. Fever diminishes, while cool sweats often break out, and the pulse becomes in many cases remarkably infrequent and slow, but at the same time extremely variable and fluctuating, as well as often irregular in rhythm and force. Respiration becomes sighing or moaning and irregular. Still later there is marked general motorial disturbance, as evidenced usually by violent, prolonged, and frequent fits of convulsions; or by tetanic rigidity, the head being drawn back, boring into the pillow, or rolling from side to side; sub-sultus tendinum; tremulousness of the limbs; local paralysis or hemiplegia; or occasionally cataleptic phenomena. The face exhibits grimaces from the muscular twitchings, with partial paralysis; the eyes are half closed, dim, and covered with a film. When not convulsed the child is generally picking at the bed-clothes, or boring the fingers into the ear or nostril. The pupils are dilated and motionless. The final symptoms include gradual anæsthesia of all the senses; deepening coma; general muscular relaxation, with slight twitchings; involuntary passage of urine and fæces; coldness of the extremities, with general cold sweats; and an extremely rapid, feeble, and irregular pulse. Death may take place from gradual coma, or during a fit of convulsions. In some cases the temperature rises considerably before death, or it may sink much below the normal. The ophthalmoscope reveals hyperæmia of the disk, ischæmia, or optic neuritis; and in very rare instances tubercles have been seen in the choroid. Sometimes the head becomes enlarged, the fontanelles at the same time being very prominent and presenting pulsation if they are not closed up.

When tubercular meningitis affects only the convexity of the cerebrum, Dr. Gee states that the prominent symptoms are a constant convulsive state, with moderate pyrexia, and a pulse which is rapid and very variable in its frequency.

The ordinary duration of cases of tubercular meningitis in children is said to be from 7 to 23 days. Rilliet states that when prodromata are wanting, it averages from 20 to 30 days. When the convexity is involved, the disease terminates in one or two weeks or even sooner. In the course of a case a remarkable remission in many of the symp-

toms is frequently observed, simulating recovery, but some of them still remain, and it is very important not to mistake this improvement for a sign of convalescence.

In the adult tubercular meningitis is generally considered as being in most cases secondary to chronic tubercular disease, especially to pulmonary phthisis, the symptoms of which often improve markedly just before those of meningitis are developed. Gee states, however, that *primary* tubercular meningitis is at least as common as *secondary*. The symptoms more or less resemble those in the child, the most prominent being severe frontal headache with darting paroxysms; heat of head, with redness of the face or alternate flushing and pallor, and suffused conjunctivæ; often a dull, bewildered, heavy, or stupid expression, with mental confusion; a tendency to somnolence and stupor, alternating with wild delirium; indisposition to speak, or sometimes sudden complete aphasia; photophobia and intolerance of sound; evidences of irritation or paralysis of some of the cranial nerves, such as twitchings or paralysis about the face, ptosis, dilated or unequal pupils, strabismus; convulsive seizures; paralysis of the limbs; and cerebral vomiting. Deep coma follows, with general paralysis, and involuntary passage of fæces and urine, terminating in death.

III. RHEUMATIC MENINGITIS.

The meningitis which exceptionally complicates acute rheumatism has been distinguished as a special variety, but it only requires to be mentioned here. Its development is usually accompanied with a marked diminution in the joint-symptoms. The symptoms are those of simple meningitis, but it is said that the early stage is less violent, and the progress of the case more rapid. It must be remembered that grave cerebral symptoms may arise in the course of rheumatic fever independently of any meningeal inflammation.

IV. ACUTE CEREBRITIS OR ENCEPHALITIS—CEREBRAL ABSCESS.

ETIOLOGY.—Inflammation of the brain-substance may result from:

1. Injury caused by fractures, wounds, or mere concussion.
2. Disease of the bones, especially in connection with chronic ear-affections, or occasionally with acute disease of the internal ear.
3. Extension from meningitis.
4. Local irritation by adventitious morbid products, extravasated blood, or spots of softening.
5. Various acute and chronic diseases, especially if attended with suppuration, the inflammation being then probably pyæmic or septicæmic in character. Thus cerebritis has been met with in low fevers, especially typhus; acute pneumonia; chronic pulmonary phthisis; dysentery; or in connection with abscesses in different parts of the body.
6. Insolation.
7. Prolonged mental labor possibly. Sometimes no cause can be made out.

ANATOMICAL CHARACTERS.—Cerebritis is described as *diffuse* or *general*, and *local*. The former does not imply that the whole brain is implicated, which is never the case, but merely that there is extensive inflammation of the superficial gray matter, this condition being only associated with meningitis, and evidenced by redness, softening, and adhesion to the pia mater when this is stripped off. Local cerebritis is limited to one or more spots of variable dimensions. Some pathologists regard this morbid change as being the invariable cause of *acute softening* or *ramollissement*, especially of *red softening*. As will be hereafter pointed out, however, it is far more likely that the condition thus described is in the great majority of cases due to other pathological causes. When resulting from inflammation, it is said that the specific gravity of the softened portion is increased. It is supposed that the color may become yellow or green from infiltration of the affected tissue with exudation or pus. The most important termination of local cerebritis is the formation of an abscess, which only happens, however, in connection with injury, bone-disease, or pyæmia. Usually the abscess is single, but there may be several, especially in pyæmic cases. The white substance in the centre of the hemisphere is its most common seat, but any part of the brain may be involved, and when the abscesses are numerous, they are usually situated chiefly near the surface. The size varies as a rule from that of a pin's head to that of a nut or egg: but a hemisphere may be occupied by one large abscess, which alters its shape and flattens its convolutions against the skull. When there are several abscesses, they are usually small. The shape is irregularly round or oval. At first the walls are ragged, softened, or inflamed: but if the disease lasts for some time, a firm fibrous or fibro-cellular capsule is formed, which may attain considerable thickness, becoming lined by a smooth membrane. The pus may be tolerably healthy, yellow or green, or sometimes red from admixture of blood; in old abscesses it becomes unhealthy, fetid, and alkaline, containing but few pus-cells, with abundance of granular matter. An abscess may burst in various directions, as on the surface of the brain; into a ventricle; into the tympanum; or in rare instances externally. In other cases the contents become inspissated, cheesy, or calcified, and surrounded by a firm capsule.

SYMPTOMS.—The special characters of the clinical phenomena of cerebritis, as distinguished from those of meningitis, are that they indicate but slight and brief excitement or none at all; while signs of failure of the cerebral functions speedily set in. The diffuse form is always preceded and accompanied by symptoms of meningitis, and in proportion as these are but little marked and of short duration; and the more rapidly stupor and coma, sensory anæsthesia, convulsions, and paralysis set in, the more probable is it that the brain itself is involved. Pyrexia also is not so high. Local cerebral inflammation is always very obscure

at the outset. Frequently there is a severe prolonged rigor at first, which may be repeated on several days with almost regular periodicity. Sometimes, without any particular previous symptoms, the patient is seized with an apoplectic or epileptiform seizure, or gradual coma sets in; occasionally sudden hemiplegia without loss of consciousness has been observed. As a rule, however, there are early symptoms, viz., deep and sometimes fixed headache, often considerable, of a dull character, but not intensified into violent paroxysms; vertigo; heat of head; restlessness and sleeplessness; a heavy expression; mental confusion; irritability; sometimes talkative, but not violent delirium; dimness of sight; partial deafness; sensations in various parts of the limbs of tingling, numbness, formication or deep pain or coldness; general weakness and languor; with tremors, twitchings, rigidity, or paralysis of various muscles. The pupils present all possible variations. There is comparatively little pyrexia. Vomiting is not infrequent. Sometimes articulation is impaired, or the patient is disinclined to speak; or complete aphasia may be observed. The subsequent symptoms in fatal cases are stupor, ending in coma; gradual loss of all sensation; convulsions, hemiplegia, or general paralysis, usually with rigidity or tetanic spasms; and involuntary escape of urine and feces. Some cases do not end fatally, but permanent disorder of the mental, sensory, or motor functions usually remains. In pyæmia it is rarely possible to diagnose cerebral abscess, and in some instances the symptoms closely resemble those of some low fever. Very exceptionally a collection of pus in the brain bursts externally.

CHAPTER LXXXI.

APOPLECTIC DISEASES.

It is necessary at the outset to make a few general observations with regard to what is meant by the term "apoplexy." Originally this merely implied an attack of sudden coma without convulsions, corresponding to what is now called an "apoplectic seizure, fit, or stroke;" such a seizure, however, was found to be most commonly due to cerebral hæmorrhage, and hence apoplexy came to be employed to indicate this pathological condition. Subsequently the word was extended to denote hæmorrhage into any organ, *e. g.*, pulmonary apoplexy. Strictly this is quite incorrect, and it is highly important to bear in mind that apoplexy and cerebral hæmorrhage are not synonymous, for the former may be due to other causes, and the latter does not always give rise to an apoplectic seizure. The comatose state characteristic of apoplexy

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is usually accompanied by other phenomena, such as an alteration in the color of the face; slow, labored, or stertorous breathing; abnormal states of the pupils; changes in the pulse; or paralysis; but these are extremely variable and inconstant, and therefore cannot properly enter into its clinical definition. The chief causes of an apoplectic seizure are: 1. Cerebral congestion (*congestive apoplexy*). 2. Cerebral or arachnoid hæmorrhage (*sanguineous apoplexy*). 3. Sudden anæmia of the brain, due to embolism or thrombosis of a main vessel; cardiac failure, especially from fatty disease; or probably vaso-motor disturbance, leading to spasmodic contraction of the arteries. Rarely a sudden apoplectiform attack is associated with: 4. Uræmia and other forms of blood-poisoning. 5. Sunstroke. 6. Organic affections of the brain or its membranes, as meningitis, abscess, chronic softening, tumors. 7. It is said sudden serous effusion into the ventricles (*serous apoplexy*). The last-mentioned cause is, however, very doubtful, and the cases in which it is supposed to have occurred were probably those of uræmic poisoning, though it must be added that some believe that uræmia may lead to cerebral symptoms by causing rapid affusion of serum. 8. In extremely rare instances a fatal apoplectic attack has occurred where no morbid condition whatever could be detected at the post-mortem examination (*simple apoplexy*). The immediate cause of an apoplectic seizure is a matter of dispute. Probably it may be due to a want of proper arterial blood in the brain, whether the result of interference with its entrance, venous engorgement, or a poisoned condition of the blood; compression or actual destruction of the nerve-elements; or shock.

I. CEREBRAL CONGESTION OR HYPERÆMIA.

ETIOLOGY.—The causes of hyperæmia of the brain are: 1. General plethora, especially that associated with excessive eating or drinking, and luxurious habits with want of exercise. 2. Increased flow of blood into the brain—*active hyperæmia* from undue cardiac action, whether merely functional or associated with hypertrophy of the left ventricle; local irritation, especially in connection with inflammatory affections; diminished resisting power of the arteries, particularly accompanying vaso-motor paralysis, as from excessive mental labor, strong emotion, sunstroke, or the effects of alcohol and other poisons; interference with the general arterial or capillary circulation, in consequence of which an extra amount of blood flows into the main arteries of the neck; or, it is said, atrophy of the brain. 3. Interference with the escape of blood out of the brain—*mechanical hyperæmia*—especially resulting from cardiac and extensive lung-affections; violent expiratory efforts with the glottis closed, as in coughing or straining at stool; hanging the head down; direct pressure upon the veins returning the blood from the brain, as by an aneurism or other tumor; or strangulation of the neck.

ANATOMICAL CHARACTERS.—The post-mortem appearances usually described as indicative of cerebral congestion are overloading of the venous sinuses and of the vessels of the membranes, including the finer branches as well as the larger veins, so that the pia mater appears extremely vascular and opaque; undue redness of the gray matter of the convolutions; and increased number and size of the drops of blood which are seen on making sections of the brain. The convolutions may be compressed, and the ventricles contracted. Niemeyer justly remarked that it is often difficult to decide whether the vessels of the membranes, and still more whether those of the brain-substance have been congested during life. He considered that the number and size of the drops of blood on section depend chiefly on its fluidity, and that œdema may follow congestion, the brain-substance then becoming unusually pale and presenting but few and small blood-spots. As a rule the signs of hyperæmia are equally distributed throughout, but sometimes they are more evident in some parts than others. Long-continued or repeated congestion leads to permanent enlargement and tortuosity of all the vessels; atrophy of the brain, with a moist, slimy condition of its substance; increase in the subarachnoid fluid; and, it is supposed, hypertrophy of the pacchionian bodies.

SYMPTOMS.—Persistent cerebral congestion is revealed ordinarily by more or less of the following symptoms: Constant dull headache, not severe, felt all over the head, or chiefly at the vertex or behind; a sense of heaviness, fulness, and oppression in the head; vertigo, which is often a prominent symptom; some degree of mental disturbance, evidenced by dulness of intellect, confusion and slowness of thought, impaired memory, indifference and indisposition for any effort or occupation, constant drowsiness, though sleep is unrefreshing and often disturbed by disagreeable dreams; photopsia, iridic colors, or specks before the eyes, or sometimes temporary diplopia or dim vision; partial deafness and noises in the head; a feeling of heaviness in the legs, especially after walking, with restlessness and fidgetiness, twitchings, or sudden startings; increased or impaired cutaneous sensibility; pains in the limbs and various paræsthesiæ, these disordered sensations being temporary and variable in their locality. These symptoms are worse after meals, mental effort or emotion, and physical exertion, as well as in the recumbent posture. There are often obvious signs of plethora about the face and head, with throbbing of the carotids.

Occasionally grave symptoms arise from cerebral congestion. The most important are those characteristic of an apoplectic attack. Various combinations of symptoms may be met with, but the distinctive features of this *congestive apoplexy* are as follows: 1. Its onset is quite sudden; it reaches its full development at once; and almost always follows some act on the part of the patient which leads to increased congestion in the head, such as hanging down the head, coughing, or straining at stool.

2. The coma is rarely complete, there being usually some in sensation, or should there be absolute loss of consciousness but a very short time. 3. There is generally partial bilateral paralysis, very rarely hemiplegia or more marked paralysis than the other. 4. Rigidity is never observed, but slight clonic spasms are not uncommon, or they may be unilateral. 5. Respiration is not stertorous. 6. The pulse is generally slow, and full. 7. There are external signs of hyperæmia about the head and face. 8. Urine and feces are not passed involuntarily. 9. Recovery is rapid and ordinarily perfect, no permanent mental paralysis of motion or sensation remaining. Some degree of confusion may be left for a time, or general impaired sensibility, muscular weakness, but these soon pass away. The patient is subject to attacks of this kind. Occasionally cerebral congestion gives rise to epileptiform seizures; and in some conditions it is attended by delirium and fever.

II. CEREBRAL AND MENINGEAL HÆMORRHAGE—SAPHEMIC APOPLEXY.

ETIOLOGY AND PATHOLOGY.—Cerebral hæmorrhage is the result of a variety of causes, the majority of cases, excluding those of traumatic origin, depending on structural changes in the minute vessels, which diminish their power, viz., atheroma or calcification; fatty degeneration; dilatation of minute aneurismal dilatations on the small arteries with a fibroid change; or the state of impaired nutrition induced by debilitating diseases, as typhus fever or scurvy. In addition to this, the vessels are not properly supported by the softening or atrophy of the brain-substance, and hence they are more liable to rupture. Not uncommonly they give way spontaneously, but this event is far more likely to happen if a state of congestion is brought about in any way, especially as the result of hyperæmia of the left ventricle, excited cardiac action, or interference with the outflow of blood from the brain. On this account cerebral hæmorrhage is more liable to follow sudden effort; straining at stool; a fit of cough; strong emotion; hanging the head down; compression of the neck; exposure to the sun; a fit of drunkenness; a warm bath; or exposure of the face of the body to cold. Among *predisposing causes* may be mentioned advanced age; hereditary predisposition to early senility; disease of the arteries; luxurious habits with want of exercise; anæmia, general plethora and want of tone. If there are signs of disease of the arteries, particularly if combined with hypertrophy or dilatation of the right cavities and renal disease, cerebral hæmorrhage is to be feared at any moment. It must be remembered that embolism or thrombosis of a large vessel in the brain gives rise to capillary extravasation in the surrounding area. In very rare

hæmorrhage into the brain has resulted from the rupture of a vascular tumor.

Traumatic injury is the usual cause of meningeal hæmorrhage, but blood may find its way from the brain into or beneath the pia mater, or into the arachnoid cavity. Another important cause of hæmorrhage into the meninges is the rupture of an aneurism on one of the main arteries at the base of the brain, especially on the basilar, middle cerebral, or one of the communicating arteries. Effusion of blood outside the dura mater is always due to injury.

ANATOMICAL CHARACTERS.—The situations in which blood may be found extravasated within the cranium are as follows: 1. Into the substance of the brain. 2. Within the ventricles. 3. In connection with the pia mater. 4. Into the arachnoid sac. 5. Between the skull and dura mater.

The pathological anatomy of hæmorrhage into the brain must be considered at some length. *Seat.*—This is by far most frequently the corpus striatum or optic thalamus. Occasionally blood extravasates into the pons, cerebellum, medullary substance of the cerebrum, crus cerebri, medulla oblongata, corpora quadrigemina, or corpus callosum. Sometimes a part of the brain, as the septum lucidum, is torn through; or the blood makes its way into a ventricle, or out on to the surface of the brain. *Amount.*—The quantity of blood extravasated varies from a few drops to several ounces, and the effusion may be so large as to alter the shape of a hemisphere, flatten its convolutions, and cause marked anæmia around. *Number.*—As a rule there is but one extravasation, but occasionally two or more are observed, though very rarely on opposite sides. Not uncommonly remains of former hæmorrhages are seen. *Recent characters and subsequent changes.*—The blood may accumulate in the form of what is termed a *capillary hæmorrhage*; or as a distinct *clot*. The former presents numerous scattered dark-red points of extravasation in the midst of cerebral substance, which is either normal, or frequently of a yellow or reddish color as well as softened, this condition constituting one form of *red softening*. A clot, if small, simply separates the brain fibres, but if large the cerebral tissue becomes broken down and mixed with the blood, while the surrounding portion is torn, at the same time being often softened and discolored from imbibition. At first the blood may be quite fluid, or partially or completely coagulated into a soft clot. Subsequently it tends to set up inflammation around, and has been known even to give rise to an abscess. In favorable cases, however, the extravasation undergoes changes ending in its absorption. It separates into its fibrinous and serous portions; becomes decolorized by degrees, passing through stages of reddish-brown, brown, yellowish-brown, and yellow; or granular pigment and hæmatoidin crystals form. Proliferation of cellular tissue takes place around, forming a capsule, and the clot may

in time be quite absorbed, an apoplectic cyst remaining, containing fluid, often loculated, which may also be removed ultimately, nothing being left but a firm, fibrous, pigmented cicatrix. It is even said that this may disappear, a loss of substance with diminution in the size of the brain being thus occasioned. The nerve-fibres which lead from the seat of hæmorrhage to the spinal cord frequently undergo degeneration.

When blood collects in a ventricle it is not nearly so readily absorbed, and in many cases becomes organized. In connection with the membranes an extravasation is generally spread out, and forms a soft red coagulum. In its subsequent changes it becomes altered in color, granular, and pigmented, the brain underneath being somewhat indurated. Finally it forms a depressed pigmented plate, with serum above.

The heart, vessels, and kidneys will be found diseased in many cases of cerebral hæmorrhage.

SYMPTOMS.—In a considerable proportion of cases of cerebral hæmorrhage *premonitory symptoms* have existed for a variable period, such as headache or a sense of heaviness in the head; vertigo; mental confusion and impaired memory; irritability; disturbed sleep or drowsiness; disorder of vision or hearing; thickness of speech; slight or temporary limited paralysis about the face or limbs; local twitchings; impaired sensation or paræsthesiæ in various parts. These phenomena may be due to mere vascular disturbance, minute thromboses, or very small extravasations. The frequent occurrence of epistaxis has been considered an important premonitory sign, and also the discovery by the ophthalmoscope of clots in the retina. There are usually indications of degeneration of vessels, as well as of cardiac disease and chronic renal mischief in many cases.

The precise clinical phenomena which result from the actual extravasation of blood into the brain differ very materially. This lesion never causes absolutely sudden death, though in rare instances a fatal termination has occurred within a few minutes. In the majority of cases the immediate symptoms which characterize cerebral hæmorrhage may be summed up as those of an *apoplectic seizure* with *hemiplegia*. The main features of the attack are as follows: It may follow some evident cause which leads to cerebral congestion, but often sets in spontaneously while the patient is perfectly quiet. The seizure is usually more or less sudden, though not absolutely so, being almost always preceded by some immediately premonitory symptoms, which occasionally last for some time, such as mental confusion, pain in the head, disorder of speech, unilateral numbness, pallor with faintness, or sickness. Sometimes a convulsion ushers in the attack. When fully developed the coma is usually very profound at first, and the deeper it is the more likely is an apoplectic fit to be due to hæmorrhage rather than other

cerebral lesions. The accompanying phenomena of the comatose state in a considerable proportion of cases of sanguineous apoplexy are flushing or even some degree of lividity, with a turgid condition of the face, and fulness of the veins; slow, labored, irregular, or stertorous breathing, with puffing out of the cheeks in expiration; throbbing of the carotids, the radial pulse being infrequent, slow, labored, full, and soft. Sometimes, however, signs of shock are noticed, the face being pale, and the pulse rapid, small, and feeble. The temperature is frequently lowered. Hemiplegia exists on the side opposite the lesion, having the extent described in the chapter on paralysis, but in many instances this condition is not easy to make out at first when the coma is very deep, the whole body being paralyzed for the time. Sometimes tremors or spasmodic movements are observed in the paralyzed limbs. The head and eyes are usually turned to the non-paralyzed side, the patient seeming to be looking over the shoulder on that side, and often both upper eyelids fall. The pupils vary much, but they are generally equal and somewhat dilated; sometimes they are unequal, or very large and insensible to light.

As regards the progress of the disease, the comatose state may end in death, which rarely happens under some hours, and not usually for two or three days, some cases lingering for four or five days or longer. Urine and fæces are then passed unconsciously, and secretions accumulate in the air-tubes, attended with loud rhonchal sounds. On the other hand, in a good proportion of cases consciousness is restored more or less speedily, and the mind is then found to be perfectly natural, or there is only slight mental confusion, which soon passes off. Occasionally delirium is observed, or the mental faculties may be permanently enfeebled, the patient sinking in time into a state of more or less dementia. The hemiplegia becomes evident on the return to consciousness, and when the right side is affected aphasia is common, which also occasionally accompanies left hemiplegia. Sensation is not nearly so much affected as motion usually, there being merely a certain degree of impaired sensibility or numbness and tingling in the extremities, and even these usually disappear before long. Now and then, however, permanent anæsthesia is noticed, either over the whole side or in limited spots, which is an indication of severe lesion. There is usually no complaint of head-symptoms or disorder of the special senses, or if such exist, they speedily pass away unless the hæmorrhage is extensive. In a few days signs of more or less inflammation from irritation of the clot are generally developed, such as headache, heat of head, restlessness, slight delirium, disturbances of vision, and twitchings or spasmodic movements in the paralyzed parts. These symptoms soon subside ordinarily, but violent inflammation may be set up, ending in extensive softening or abscess, indicated by a relapse into the comatose state, with general paralysis and involuntary evacuations before death, which

event may take place from this cause in three weeks or more. Should a case proceed favorably, the motor paralysis often diminishes greatly in time, the improvement following the usual course, but the restoration is not often complete, certain muscles generally remaining permanently disabled. In other cases there is little or no improvement, and "late rigidity" may ultimately set in.

Some of the chief clinical variations due to the *extent* and *seat* of cerebral hæmorrhage will now be noticed. In the case of a cerebral hemisphere the degree and duration of the comatose state depend mainly on the amount of the extravasation. Hence, if this is moderate, there may be only partial loss of consciousness, the patient exhibiting signs of sensation and perception, while the mental faculties are very speedily and completely restored. If the extravasation is very small, there is no impairment of consciousness at all, and the lesion is merely indicated by *sudden hemiplegia*; or this is noticed when the patient attempts to move in the morning, the hæmorrhage having occurred during the night. The degree and persistence of the paralysis depend on the seat of the extravasation, as well as its extent. Thus a small effusion into either corpus striatum or optic thalamus will give rise to hemiplegia, and if it is of some size the paralysis is permanent. Dr. H. Jackson is of opinion that the arm suffers less and the leg more the further back the lesion is placed; and that when the optic thalamus is implicated, there is diminution, or, soon after the attack, loss of sensation on the paralyzed side. A clot in any other part of the hemisphere may cause no symptom whatever, if of small size, and it is only accompanied with hemiplegia if it presses upon the central ganglia, and interferes with their supply of blood. Even then it is only partial, while recovery is frequently complete and rapid. Hæmorrhage into the cortical substance is usually attended with convulsions, and subsequently by marked mental disturbance, meningitis being often set up. When a very large clot occupies a hemisphere, so that the opposite one is also interfered with, bilateral paralysis is produced, though it is not equal on the two sides, only some degree of weakness being observed on the same side as the lesion. General paralysis may also result from extravasation into both hemispheres, but this is extremely rare. If there is extensive laceration of the brain, rigidity and muscular twitchings are prominent. In some cases no impairment of consciousness is observed at first, or this is only partial and of brief duration, but afterwards, owing to increase of the hæmorrhage or to the rupture of another vessel, profound coma may set in, ending in death.

Hæmorrhage into the inner part of the crus cerebri is signified by paralysis of the third nerve on the same side, with opposite hemiplegia. Ventricular hæmorrhage is attended with profound coma and general paralysis, as well as in some cases with convulsions or marked rigidity and twitchings; or more commonly these symptoms follow the signs of

hæmorrhage into one hemisphere, which is very significant. Cerebellar hæmorrhage has exceedingly indefinite indications. Very urgent vomiting; severe pain at the back of the head; and hemiplegia without implication of the face and tongue, have been considered its most characteristic signs. There may or may not be loss of consciousness. If either crus cerebelli is injured, one eye is turned up and out, the other down and in. Considerable extravasation into the middle of the pons varolii causes profound coma; general paralysis: marked contraction of both pupils; and usually speedy death. The condition greatly resembles that accompanying opium poisoning. When the effusion takes place into one-half of the pons the facial, fifth, and sixth nerves may be paralyzed on the same side as the lesion, along with paralysis of the limbs on the opposite side; or if a certain part is involved, both facial nerves are affected. Sensation is also frequently much impaired. Hæmorrhage into the medulla oblongata generally proves very rapidly fatal. When blood escapes into the arachnoid sac or subarachnoid space, the attack is usually not so sudden, but the symptoms are very variable. At first premonitory symptoms are frequently present, as severe headache, vertigo, partial loss of motion, somnolence, or impairment of intellect. Among the signs which may be considered as most suggestive of this form of hæmorrhage are gradually developed coma; hemiplegia without implication of the face, or paralysis beginning on one side and afterwards extending to the opposite one; the occurrence of convulsions, marked spasmodic contractions, or rigidity of the limbs; and the supervention of signs of severe meningitis in a few days. Sensation is rarely affected. When meningeal hæmorrhage is considerable, it may be impossible to distinguish it from extravasation into the brain.

III. CEREBRAL EMBOLISM AND THROMBOSIS—SOFTENING.

ETIOLOGY AND PATHOLOGY.—The pathology of softening of the brain is much disputed, but I propose to treat of this morbid condition in connection with embolism and thrombosis, because it seems to me certain that softening is in the great majority of cases due to vascular obstruction thus induced. A cerebral embolus of any size generally has its origin in valvular disease of the heart, but it may come from an aneurism or a pulmonary thrombus. Minute emboli may also be detached from old clots, or from the inner surface of diseased vessels. The formation of thrombi is almost always associated with degeneration of the cerebral vessels, which, however, may be aided by a feeble state of the circulation, and certain conditions of the blood.

The main pathological causes to which the different forms of cerebral softening have been attributed may be summarized thus: 1. Local inflammation of the brain-substance. 2. Obstruction of arteries or capillaries by emboli; of arteries, veins, or venous sinuses by thrombi. 3.

Pressure upon a main artery by a tumor. 4. A diseased condition of the walls of the small arteries and capillaries, narrowing their calibre, and interfering with the nutritive relation between the blood and tissues. 5. Diminished nutritive activity in the tissue-elements, leading to their degeneration. 6. Effusion of blood into the brain. 7. A peculiar chemico-pathological change in the brain-substance, attended with the liberation of phosphin, and one or more of the fatty acids. This form of softening is said to be often observed around adventitious products and old clots, but occasionally is independent of these (Rokitansky). 8. Edema of portions of the brain. 9. Atrophic softening, due to separation of nerve-fibres from their ganglionic communications. I have already expressed my own view as to embolism and thrombosis being by far the most frequent cause of cerebral softening, the nutrition of the part thus deprived of blood being impaired, sometimes to such a degree as to cause its actual death, œdema and capillary hæmorrhage also in some cases contributing to the process of softening. It must not be forgotten that the brain may become softened as the result of a post-mortem change. With regard to *predisposing causes* of cerebral softening, this lesion is most common in advanced age, on account of the condition of the vessels, but when due to embolism it may be met with in young adults or even in children. Excessive and long-continued mental strain undoubtedly aids in its production, and it is by no means improbable that this may so disturb the balance of nutrition as of itself to give rise to softening.

ANATOMICAL CHARACTERS.—An embolus may lodge in one of the arteries before reaching the circle of Willis, and then, owing to the collateral circulation being readily set up, no permanent evil consequences ensue. Almost always, however, it passes into a branch beyond this, most frequently the *middle cerebral artery*, especially the left. The immediate result is anæmia of the portion of the hemisphere which this artery supplies, and as its anastomoses are not abundant, this is followed by softening with œdema, while there is a determination of blood into the surrounding capillaries, which often give way, giving rise to capillary hæmorrhage, especially at the circumference of the affected part. The effects may partly disappear in course of time in young persons whose vessels are healthy and distensible, and it is not improbable that the consequences of embolism in the minute vessels are often recovered from. After an embolus has been lodged for some time, it may be difficult or even impossible to discover it.

In arterial thrombosis the vessels will generally be found extensively diseased, many of them being usually blocked up. This condition will also lead to anæmia and softening, but owing to the morbid state of the minute vessels, and to several of them being obstructed, there is no increased vascularity around the affected part as a rule, this being very pale, while if a vessel of any size is obstructed, for the same reasons

restoration cannot be expected. Thrombosis of the veins and sinuses is generally associated with inflammation from injury or bone-disease. It may arise, however, from feebleness of circulation with blood changes, the thrombus first forming in the superior longitudinal sinus and then extending, leading to more or less effusion of serum into the ventricles and subarachnoid space, or rarely even to hæmorrhage here or into the brain-substance, but especially to scattered patches of red softening with capillary hæmorrhages in the gray matter of the convolutions, or occasionally more extensive softening.

Three chief forms of cerebral softening are described, viz., *red*, *yellow*, and *white*, but the softened part may present numerous varieties of these tints, or other colors, such as brown or greenish. The degree of diminution in consistence varies from what is scarcely appreciable to that of almost a fluid pulp. It is determined by touch; or by allowing a piece cut out of the softened part to stand, and observing how soon the angles round off, or pouring a gentle stream of water upon it. The seat and extent of softening vary greatly, and very different statements have been made as to the frequency with which different parts of the brain are involved, but the usual seats seem to be the corpus striatum, optic thalamus, central white matter of the hemisphere, and convolutions. In embolic softening the left hemisphere is most commonly affected. The morbid condition is rarely well-defined, but shades off into the surrounding brain-tissue. A section appears swollen, and often rises above the surrounding level. A highly important character of all forms of cerebral softening, except, it is said, the inflammatory, is that the specific gravity of the softened part is considerably below that of normal brain-substance. Microscopical examination reveals more or less destruction of the nerve-elements, until in extreme cases no trace of them is left; abundant granular cells, not of inflammatory origin, but chiefly derived from granular degeneration of the cells of the neuroglia or of nerve-cells; granular fatty debris; particles of myelin; blood-cells in some varieties, or their remains in the form of pigment and hæmatoidin crystals. The capillaries often show signs of degeneration, and are in some forms dilated or present little aneurismal swellings.

It is necessary to offer a few remarks respecting the three main forms of softening. *Red softening* may be inflammatory in its origin, but in the great majority of cases it depends upon obstruction of large arteries or venous sinuses. The tint at first may vary from pink to deep claret, being most intense in the gray matter. Afterwards it undergoes changes, assuming different hues of yellow, brown, chocolate, buff, etc. *Yellow softening* usually results from changes in the red variety, but the peculiar form due to the chemico-pathological change is described as being of this color. *White softening* is considered by some pathologists as the ultimate condition of the red, but undoubtedly it is not uncom-

monly a primary form, especially in connection with extensive thrombosis and atheroma of the vessels. It is also observed in oedematous and atrophic softening.

Reparative processes may be set up after softening. On the surface of the brain circumscribed yellow patches—*plaques jaunes*—are produced, of tough consistence, implicating the gray matter of the convolutions. In the interior of the organ a cavity forms, bounded and traversed by a white or grayish or sometimes yellowish vascular connective-tissue, which may divide the space into loculi, and these contain a milky fluid holding in suspension abundant fat-granules and corpora amylacea. This fluid may be absorbed, contraction and ultimate closure of the cavity subsequently taking place.

SYMPTOMS.—It will be requisite in treating of the clinical history of cerebral softening, to describe it under the two forms of *acute* and *chronic*. The latter is considered in the chapter on Chronic Diseases of the Brain.

Acute Softening.—Practically it will only be necessary here to indicate the respective symptoms of *embolism of the middle cerebral artery* and *thrombosis*. Embolism may occur at any age, being not uncommon in young persons; some morbid condition likely to originate an embolus can generally be discovered; while in most cases no premonitory head-symptoms have been noticed. The usual indications of the lodgment of the embolus are sudden loss of consciousness and evidences of shock; with hemiplegia, generally on the *right* side. The case may end fatally, or consciousness may return, but the hemiplegia remains, aphasia being also very frequent. The paralysis is rarely recovered from entirely, but power may be partially restored, especially in young persons. In one case which came under my notice the leg recovered perfectly, but the arm, face, and tongue remained permanently paralyzed.

Arterial thrombosis is met with either in old persons or in those who are prematurely aged; and usually, but not always, well-marked signs of degeneration of the vessels of the limbs are obvious, along with a feeble heart and other evidences of decay. Commonly there have been marked premonitory symptoms, due to interference with the cerebral circulation or the formation of minute thrombi, as described under Cerebral Hæmorrhage. The mode of attack varies, but is usually more or less apoplecticiform. Should a large artery or several smaller vessels be suddenly obstructed, a sudden apoplectic seizure with hemiplegia occurs, frequently not distinguishable from sanguineous apoplexy. By far more commonly, however, the onset is gradual, there being marked mental disturbance of some kind before the coma supervenes, such as transient excitement, confusion of thought, irritability, or mild delirium, the patient often talking incoherently or acting strangely. There may be complete loss of consciousness for a brief period, but this con-

dition soon passes away, and almost always when the patient is seen the coma is only partial, indications being afforded that sensation and perception are not entirely abolished. In some cases apoplectiform attacks are repeated with partial restoration in the intervals, absolute coma being ultimately developed, with general paralysis and involuntary passage of fæces and urine, death taking place in a few days. In others the mental faculties become by degrees considerably improved, even up to the previous standard; but as a rule the intellect remains markedly impaired, and this condition tends to become speedily worse and worse. There is frequently permanent aphasia or defect of speech. When sufficiently restored, the patient often gives indications of pain or uneasiness in the head; and of hyperæsthesia, dysæsthesia, or various paræsthesiæ in either or both limbs on one side. Hemiplegia is usually present, and during the apoplectic condition the head and eyes are often turned to the sound side. Sometimes the paralysis is bilateral or confined to one limb. Generally it is not complete, being also more marked in the arms than the legs, and at the extremities of the limbs than in other parts. Early spasmodic contractions in the paralyzed part are very common, in the way of clonic spasms, jerkings, or rigid flexion of joints, especially of the shoulder, elbow, and knee. The affected limbs are often exceedingly irritable on percussion. The paralysis is not likely to diminish. Hemiplegia without loss of consciousness is far more common in thrombosis than in cerebral hæmorrhage, and the paralysis may come on in a progressive manner, which is very characteristic, affecting first one limb and then the other, at the same time becoming more marked by degrees. Occasionally the early symptoms assume the characters of irregular epileptiform attacks occurring in rapid succession, attended with mental disturbance, ending in coma and hemiplegia. In other instances delirium is the prominent symptom at first, usually mild, sometimes violent, alternating with and finally ending in coma. The subsequent course of cases of acute softening varies much; many of them become very chronic, the patient gradually sinking into a state of imbecility, and being permanently bed-ridden and helpless; the opposite side often becoming weak; "late rigidity" setting in in the paralyzed muscles; and nutrition being much impaired.

CHAPTER LXXXII.

CHRONIC DISEASES OF THE BRAIN AND ITS MEMBRANES.

I. CHRONIC MENINGITIS.

ETIOLOGY.—Chronic meningitis is chiefly met with as the result of former injury to the skull; prolonged mental labor, especially if com-

blined with much anxiety ; chronic alcoholism ; and irritation by tumors and morbid deposits, especially syphilitic. In rare instances it remains after the acute disease. It is by far most common after middle age, and in males.

ANATOMICAL CHARACTERS.—The most frequent post-mortem signs of chronic meningitis are thickening and increased firmness of the membranes in different parts, sometimes extreme, with opacity of the arachnoid ; adhesion of the membranes to each other, of the dura mater to the skull, or of the pia mater to the brain ; increased vascularity, particularly of the pia mater, with permanent enlargement of many vessels ; serous effusion into the meshes of the pia mater, there being also sometimes a considerable quantity of turbid fluid in the sub-arachnoid space ; exudation, especially in the sulci and around the vessels, often surrounding and pressing upon some of the cranial nerves, and becoming organized and firm ; the presence of excess of clear or flocculent serum in the ventricles, the lining membrane of which becomes thickened and rough. Calcareous or osseous laminae may be formed in the thickened membranes, and the convolutions of the brain are sometimes atrophied. Increase in number and enlargement of the pacchionian bodies has been considered a result of chronic meningitis.

SYMPTOMS.—These are often very obscure and ill-defined, being a combination of symptoms due to excited action and impaired function of the parts involved. The most important are : 1. More or less constant general headache, of dull and heavy character, not severe or attended with exacerbations. 2. Persistent vertigo, the patient staggering while walking, as if drunk, but particularly on looking suddenly round over the shoulder. 3. Mental excitability at times, especially in the evenings, with peevishness, irritability, restlessness and wakefulness ; alternating with marked depression, the patient becoming apathetic, gloomy, low-spirited, and apprehensive. 4. In course of time failure of the intellectual faculties, sometimes ending in extreme dementia. 5. Subjective sensations of flashes of light, iridic colors, tinnitus aurium ; with at the same time diplopia or more or less impairment of sight in one eye, or partial deafness. 6. Hyperæsthesia of some part of the skin, with hypæsthesia or numbness of other portions. 7. Irregular twitchings or clonic spasms of various muscles, especially those of the face and eyeballs, causing grimaces and often external strabismus ; also of the muscles of the limbs, which may present curious spasmodic movements from time to time, or rigidity. 8. Irregular motor paralysis, usually incomplete, accompanying and following the above movements, affecting first the cranial nerves on one or both sides, as indicated by partial ptosis, drawing of the face to one side, strabismus or immobility of the eyeball, slight deviation of the tongue and thickness of speech ; then extending to the limbs, in some

cases only a few fingers or certain muscles being involved, in others the whole arm, one arm and leg, or sometimes all the limbs more or less. Irregular epileptiform attacks not uncommonly occur, but they are not attended with any special cry or stoppage of respiration and its consequences, while consciousness is not completely lost. The fit lasts an indefinite and often a considerable time, and is not followed by the comatose state observed in true epilepsy. In most cases some pyrexia is noticed towards evening, with heat of head, flushing of the face, and conjunctival injection. Nausea and vomiting, with obstinate constipation, are not infrequent symptoms. Any excitement tends to increase the symptoms markedly. The ophthalmoscope often reveals neuritis or ischæmia.

II. CHRONIC CEREBRAL SOFTENING.

SYMPTOMS.—It is only requisite to describe here the clinical history of softening which is chronic from the commencement. Its chief symptoms are: 1. Headache in many cases, persistent but not severe; usually of heavy character, and sometimes only amounting to a feeling of weight and heaviness; frontal as a rule, occasionally general, but never unilateral or localized. 2. Mental changes, viz., gradual failure of the intellectual faculties one after another, of which the patient is generally aware at first, which may ultimately end in complete dementia or mania; change in manner, disposition, and temper; various forms and degrees of aphasia, a tendency to repeat the same words several times and on all occasions being considered very characteristic; marked lowness of spirits; emotional disorder, the patient being either apathetic or the emotions being but little under control, and quasi-hysterical fits of crying or laughing occurring without cause; sometimes a restless and excited manner at night, or even mild delirium. Occasionally the mind seems unaffected. 3. Sensory disorders, especially superficial and deep pains in various parts of the limbs, hyperæsthesia or dysæsthesia, formation, numbness, and gradual impairment of sensation, seldom amounting to complete anæsthesia; some degree of failure of sight and hearing, but rarely complete blindness or deafness. 4. Motor disturbance, in the way of paralysis, incomplete in degree and developed gradually, and often in an intermittent manner, usually beginning in either arm or leg, but soon being more or less generally but irregularly distributed, though one side is as a rule more affected than the other, or sometimes confined to special groups of muscles, such as those of the face or part of a limb; frequently tonic rigidity, gradually increasing; tremors or clonic spasms, especially in the paralyzed muscles, with undue irritability on percussion; and sometimes epileptiform convulsions. The subjects of chronic softening commonly present an old or prematurely aged, unhealthy, cachectic appearance. Degeneration of the vessels, weak heart, and granular kidneys are frequently well-marked. Usually

the bowels are obstinately constipated. The duration of the disease is very variable. At last gradual coma sets in, usually with general paralysis and relaxation of the muscles, and involuntary passage of urine and feces. Speedy and unexpected death may happen from extensive thrombosis or hæmorrhage.

III. ADVENTITIOUS GROWTHS IN CONNECTION WITH THE BRAIN AND ITS MEMBRANES—CEREBRAL TUMOR.

ANATOMICAL CHARACTERS.—The chief cerebral adventitious growths or tumors include: 1. Cancer. 2. Tubercle. 3. Syphilitic deposit. 4. Sarcoma. 5. Myxoma. 6. Glioma. 7. Cholesteatoma. 8. Lipoma. 9. Parasitic cysts, viz., cysticercus cellulosus and hydatids. 10. Cysts containing fluid, fat, or hair; or presenting cauliflower excrescences. 11. Aneurisms. 12. Vascular erectile tumors. 13. Osseous or calcareous masses. Only the anatomical characters of the first three will be described here.

Cancer.—All forms of malignant disease are met with, but far most commonly encephaloid, which usually occurs as a more or less round or lobulated tumor of very variable size, generally single if primary, sometimes numerous if secondary. The growth may be inseparable from the brain-substance; distinctly defined; or surrounded by a cyst. The usual seat of cancer in the brain is the cerebral hemisphere, but it may occupy any part. It often shows signs of degenerative changes in its interior. It must be mentioned that cancer may originate from other structures within the cranium besides the brain itself, and then tends in some cases to make its way outwards; on the other hand it may begin outside the skull and grow inwards.

Tubercle in the brain is described as forming irregularly-roundish masses, yellow and caseous-looking, dry and bloodless, sometimes continuous with the brain-substance through a grayish-white somewhat translucent border, in other cases separated by a cyst. As a rule there is but one such mass, occasionally two, rarely more. The size generally varies from that of a hempseed to a cherry, but it may be equal to a small egg. Tubercle ordinarily occupies the cerebrum or cerebellum, rarely the pons. It often softens in the centre into a purulent-looking fluid, or an actual cavity may form.

Syphilitic Disease.—Syphilitic deposit is far more commonly met with in connection with the membranes than in the brain itself. These are matted together, the dura mater being closely adherent to the skull at the seat of disease, and the inner membranes to the cerebral substance, while there is more or less thickening from the accumulation of a tough material, yellow in the centre, but usually presenting a grayish-white border around. This often involves some of the nerves. In the brain syphilis generally causes mere induration from interstitial proliferation

of cellular tissue, especially at the surface. Gummata are extremely rare; they assume the form of irregular nodules or tumors, which may attain the size of an egg, their shape being often modified by the part of the brain in which they occur, and they always pass gradually into the surrounding tissue by a grayish softer material or by indurated infiltration. A section is yellowish-gray or yellowish and translucent; cheesy or gluey in consistence; and often presents signs of decay in the form of opaque spots scattered over the entire surface, but there is no central softening such as is observed in tubercle. The more vascular parts of the brain are the usual seats of syphilitic gummata. Generally there is only a single deposit.

SYMPTOMS.—There is no disease of the brain in which the symptoms are more diverse in their characters and course than in the different kinds of tumor, so much depending on situation, size, shape, number, and rapidity of growth. Further the symptoms are not only due to the mechanical effects of the tumor, but those of softening, hydrocephalus, and chronic meningitis are often added after a time.

Occasionally a tumor, even of considerable size, is quite latent throughout; or a sudden apoplectic attack, the result of congestion or hæmorrhage, reveals its existence. The characteristic clinical features of a cerebral tumor, however, are as follows: 1. Headache, at first slight, but by degrees becoming very severe; often localized, though not necessarily over the seat of the tumor; constant, and of dull grinding character, but subject to violent exacerbations, which may be accompanied with obstinate cerebral vomiting, the pain being often increased by any excitement, coughing, sneezing, a deep breath, or strong light. 2. Marked vertigo or a peculiar dizziness on movement in some cases. 3. Absence of any mental disturbance in uncomplicated cases, unless a tumor is very large or rapid in its growth, or that several are scattered through the cortical substance. 4. Signs of irritation followed by gradual paralysis of such of the cranial nerves as the growth implicates, these being generally unilateral. Vision is often affected, terminating in complete blindness, and it is not uncommon for one eye to be involved after the other. Smell and hearing may also be impaired or lost, the latter usually on one side. Severe neuralgic pains, hyperæsthesia, and paræsthesiæ frequently affect the fifth nerve, followed by gradual loss of sensation to complete anæsthesia, and paralysis of its motor portion occasionally. The facial nerve is most commonly implicated; next the third and sixth; and sometimes the fourth, there being first twitchings and spasmodic movements, followed by paralysis of the muscles supplied by these nerves; when the paralysis is complete electric irritability becomes usually quite extinct. Partial paralysis of the eighth and ninth nerves is not uncommon, causing impairment of speech and deglutition, or sometimes disturbance of respiration or cardiac action. 5. Disorders of sensation and motion in the limbs. These are,

if present, as a rule of more or less hemiplegic distribution, and are observed on the side opposite that on which the cranial nerves are implicated. Rarely they are bilateral, or may be very limited. At the outset signs of irritation are observed, followed by gradually progressive paralysis, which is accompanied with spasmodic movements or rigidity. Electric irritability is not lost in the limbs. When a tumor occupies the interior of one cerebral hemisphere, there may be pure hemiplegia. Epileptiform convulsions are not uncommon, the convulsive movements being frequently localized mainly in some particular part. When a tumor occupies certain portions of the brain, peculiar rotatory and other movements are observed. The important ophthalmoscopic signs of cerebral tumor are those of ischæmia; descending neuritis; or atrophy of the disk. Occasionally a tumor becomes evident externally. In cases of aneurism, it is said that a murmur has been occasionally heard. The general condition of the patient varies much. The constitution is affected gravely, should there be much suffering with loss of sleep. Sometimes considerable emaciation and marasmus, or evidences of some cachexia are observed; or cancerous, syphilitic, or tubercular deposits may be discovered in other parts. The mode in which cases of cerebral tumor terminate is very variable. In those which have come under my observation the end was always unexpected, acute symptoms setting in without any obvious cause.

IV. CHRONIC HYDROCEPHALUS.

ETIOLOGY AND PATHOLOGY.—Chronic hydrocephalus is characterized by accumulation of fluid either in the ventricles; in and beneath the arachnoid; or in both these situations. In the great majority of cases the condition is either congenital or shows itself within six months after birth, and has then been chiefly attributed to arrest of development of the brain; or to chronic inflammation of the ventricular lining membrane. It may come on as an acquired complaint, however, in older children, or very rarely even in adults, being then the result of closure of the venæ galeni, usually owing to pressure by a tumor. Chronic hydrocephalus has no connection with tubercle, but it is not uncommon in rickets. Excess of fluid may accumulate in the arachnoid in connection with senile or other atrophy of the brain; or after previous hæmorrhage.

ANATOMICAL CHARACTERS.—The quantity of fluid varies from a few ounces to several pints. It is usually watery, limpid, and colorless; of low specific gravity; and contains but a very small quantity of albumen, with some saline matter. The ventricular lining membrane is often altered in appearance, thickened, granular, and rough. The arachnoid is stretched, and signs of chronic meningitis are often observed about the base. The brain is altered in shape, sometimes unsymmetrical, its convolutions being flattened and spread out; and

its texture is in many cases firmer than natural, or, on the other hand, soft and macerated. The optic nerves are usually much stretched. The cranial bones are frequently expanded and thinned, the fontanelles and sutures being considerably widened; sometimes the bones are thickened but spongy.

SYMPTOMS.—Only the signs of chronic hydrocephalus as it is met with in children need be considered here. The head enlarges, in some cases to an enormous size, so that it falls from side to side if not supported; and at the same time assumes a curious shape becoming round and globe-like, with a very large and prominent forehead, the bones being driven apart, while the orbital plates of the frontal are pushed down, especially behind, the eyeballs being thus pressed forwards so as to become very prominent and to look downwards. The fontanelles and sutures are widened to a variable degree as well as prominent, while frequently distinct fluctuation can be felt. The scalp feels thin, sometimes almost as if it were going to give way, and the bones may be so attenuated as to yield a crackling sensation. The lower part of the face looks very small, and has a curious worn or stupid expression. It may present a puffy appearance, with enlarged vessels on the cheeks. The nervous symptoms which are liable to be met with are headache, though this is often absent; vertigo; non-development or gradual failure of the mental faculties even to complete imbecility; disturbed sleep at night, with drowsiness by day; marked peevishness, irritability, or depression of spirits; failure of the special senses, especially that of sight, with signs of ischæmia or atrophy of the disk; restlessness, with general muscular weakness and loss of co-ordinating power, tottering gait, tremors of the limbs, spasmodic movements or convulsions coming on without any obvious cause, strabismus, or laryngismus stridulus. The body is generally much wasted; circulation is feeble; and the child always feels cold. Excessive appetite, vomiting, and constipation with unhealthy stools are common symptoms. The duration of these cases is variable, but usually death occurs within the first few years of life, chiefly from gradual or sudden coma; exhaustion; convulsions; or laryngismus.

V. HYPERTROPHY OF THE BRAIN.

Only a few remarks are required concerning the so-called hypertrophy of the brain observed in children. This is associated either with rickets or congenital syphilis, and the increase in size and weight is probably due either to albuminoid infiltration of the white substance or to increase in the neuroglia. The tissue becomes unusually firm, pale, and dry, the convolutions being compressed, flattened, and closely packed. The head expands, but the enlargement is distinguished from that of chronic hydrocephalus by being much less rapid in its progress, never attaining any great size, and by having an elongated form from before

back, while the fontanelles and sutures are not at all or but little apart, the former being often depressed and not fluctuating, and the eyes are sunken. Frequently there are no evident symptoms, but if the head is closed before the brain enlarges serious symptoms are liable to arise, such as severe headache, vertigo, mental failure, epileptiform attacks, paralysis, or coma.

CHAPTER LXXXIII.

DISEASES OF THE SPINAL CORD AND ITS MEMBRANES.

CLINICAL CHARACTERS.—The symptoms of affections of the spinal cord differ very considerably according to the seat and extent of the disease. For instance, it may be involved high up or low down; at a limited spot or extensively throughout its length; in its entire thickness or only along one or more of its tracts. A knowledge of the physiology of the cord will readily explain these clinical variations. The usual indications of disease of the spinal cord are: 1. Local morbid sensations, or occasionally evident objective changes. 2. Sensory and motor derangements involving both legs and the lower part of the trunk, there being often complete sensory and motor paraplegia, with marked derangement as regards reflex and electrical phenomena, and a tendency to rapid failure of nutrition. 3. Paralysis of the bladder and rectum. 4. Sexual disorder, in the way of constant priapism, or loss of sexual desire or power. If the cord is involved at its upper part the entire trunk as well as the arms are implicated, while respiration becomes more or less disturbed. When only the posterior columns are affected, co-ordinating power over the muscles is lost. Mental disturbance or obvious signs of interference with the functions of the cranial nerves are not observed unless the disease extends to the brain, but there may be difficulty of deglutition, mastication, or speech in some forms of disease implicating the summit of the cord.

I. ACUTE SPINAL MENINGITIS.

ETIOLOGY.—The causes of this disease are: 1. Traumatic injury. 2. Caries of the vertebræ. 3. Exposure to cold and wet, especially local, to sudden changes of temperature, or to powerful direct heat over the spine. 4. Acute rheumatism very rarely. 5. Adventitious deposits and tumors, especially syphilitic. 6. Tetanus, chorea, or hydrophobia, it is said. 7. Epidemic cerebro-spinal meningitis. 8. Extension from cerebral meningitis.

ANATOMICAL CHARACTERS.—The post-mortem appearances resemble more or less those of cerebral meningitis. Usually the membranes are extensively affected, the pia mater being very vascular, infiltrated, and thickened. A soft exudation often covers its surface, as well as that of the arachnoid, while fluid occupies the sub-arachnoid space, either turbid and flocculent or more or less puriform in appearance. This may be so abundant as to distend the dura mater considerably. The

latter is frequently reddened, and fluid may accumulate between it and the bones, or it may exhibit signs of local injury or irritation.

SYMPTOMS.—Acute spinal meningitis is characterized at the outset by signs of irritation of the roots of the spinal nerves, followed by those of paralysis. The early symptoms are severe paroxysms of pain along the spine, but only coming on when the patient moves; tenderness on deep pressure, though not very marked as a rule; pains shooting from the spine into the limbs and trunk, but especially the legs, though sometimes they may be chiefly felt in the arms, or even in one arm if the inflammation is limited; some degree of hyperæsthesia; contraction of the muscles of the neck and back, which may cause opisthotonos, usually regarded as being due to tetanic spasm, but also considered as an instinctive act to avoid pain; fits of painful spasm in the limbs, neck, and back, with involuntary startings and jerks, but not the powerful spasms observed in tetanus; some embarrassment of breathing, which is considerable if the respiratory muscles are affected with spasm, being then attended with a sense of oppression and suffocation; occasionally some difficulty of mastication and deglutition; and irritability of the bladder. The attack may be ushered in with a chill, followed by slight pyrexia. The patient is usually very restless, anxious, and sleepless, but there are no head-symptoms. Afterwards muscular weakness is observed, beginning below and extending upwards, with partial loss of power over the bladder and rectum. In fatal cases death may occur from implication of the cerebral membranes, or from the cord being compressed by inflammatory products, or becoming itself inflamed.

II. CHRONIC SPINAL MENINGITIS.

But little is definitely known about this morbid condition. It is chiefly met with in connection with bone-disease and adventitious growths, especially syphilitic. Anatomically it may be revealed by thickening, induration, and roughness of the membranes; remnants of old inflammatory products; adhesions or bands passing across the sub-arachnoid space; and sometimes calcareous deposits. Syphilitic growths present characters similar to those in the cerebral membranes.

SYMPTOMS.—These are described as slight pain over some part of the spine; severe pains in the limbs, of a rheumatic character; paræsthesiæ in the legs, with gradually increasing hypæsthesia, but not complete anæsthesia; slight spasmodic movements in the limbs followed by paralysis, beginning in the lower extremities and gradually extending upwards to the trunk, bladder, rectum, or even to the arms, at first slight but increasing very slowly, persistent but subject to marked variations in its course. Ultimately there are all the signs of destruction of the cord.

III. ACUTE MYELITIS—INFLAMMATION OF THE CORD.

ETIOLOGY.—Acute myelitis may result from caries of the spine; injuries, including also severe strain and concussion; irritation by adventitious growths or clots; cold; or direct exposure to powerful heat. It has also been attributed to suppression of perspiration or of chronic discharges, the sudden cure of a chronic skin disease, or sexual excess.

ANATOMICAL CHARACTERS.—Inflammation of the cord usually begins in the central gray matter, and may either extend along this from one end to the other, or be confined to one or more portions of the cord, spreading throughout its entire thickness, especially opposite the lumbar enlargement. The affected tissue is generally much softened, often of cream-like consistence; more or less reddened at first, but afterwards may be yellowish; swollen and relaxed, the entire cord sometimes presenting a distended appearance, or being nodulated on the surface, and the central gray matter having lost its contour. Sometimes small extravasations of blood are observed. Very rarely an abscess forms. The microscope reveals broken-down nerve elements, granules, blood-cells, and granular or pus-corpuscles. There is always more or less meningitis. A form of acute myelitis is described in which the cord becomes indurated, owing to fibrinous exudation. This has been considered by some pathologists as always preceding softening; by others, probably more correctly, as being the result of a less acute process.

SYMPTOMS.—Myelitis is characterized by the absence of the signs of irritation of the nerves observed in meningitis; with rapid development of those indicative of destruction of the cord. Its special symptoms are described as slight pain over the spine, usually circumscribed, not increased by movement or moderate pressure, but intensified by kneading, and especially by applying a hot sponge or ice, which produces a burning sensation at the upper limit of the inflammation; a feeling of constriction around some part of the trunk, as if it were bound by a tight cord; marked paræsthesiæ in the limbs and trunk, but especially in the legs, such as tingling, formication, furriness, numbness, or subjective coldness, speedily followed by paraplegic or more extensive hypæsthesia or anæsthesia; marked restlessness, followed rapidly by muscular paralysis below the seat of inflammation, therefore usually paraplegic; loss of power over the bladder and rectum, not uncommonly accompanied with great irritability, the patient desiring to have the catheter passed very frequently; and constant priapism. In the paralyzed parts electric sensibility and contractility are usually impaired or lost; so as a rule is reflex excitability, but should the portion of the cord below the seat of inflammation be healthy, this is exaggerated. When the myelitis extends high up, respiration is more or less impeded, the voice is weak, and there may be dysphagia or difficulty of speech. There is little or no fever. The disease may either soon termi-

nate fatally, or pass into a more or less chronic condition. Occasionally the inflammation is limited to one-half or to certain tracts of the cord, and the symptoms will be limited accordingly.

IV. CHRONIC MYELITIS—WHITE SOFTENING.

ETIOLOGY AND PATHOLOGY.—Softening of the spinal cord may have its origin either in acute or chronic myelitis; gradual pressure upon it; injury; or failure of nutrition from degeneration of its vessels. The softened cord is quite white in the degenerative form, or it may present a more or less red or yellowish color. Abundant granular corpuscles and granules are visible under the microscope.

SYMPTOMS.—If the cord becomes gradually diseased, the signs of the change are more or less of the following character: Dull pain or uneasiness over some portion of the spine, increased by pressure, percussion, the application of a hot sponge or cold, but not by movement, a feeling of tightness round the body; distressing paræsthesiæ, wandering pains, or fidgety sensations in the legs, followed by gradual loss of feeling to complete anæsthesia, this often extending up the body to a variable extent; twitchings, spasmodic movements, and cramps in the legs, with diminished power, dragging of the legs in walking, and a sense of heaviness and fatigue, ending in paraplegia; frequently a strong tendency to painful contractions and rigidity in the paralyzed limbs, the legs being in many cases drawn up involuntarily if left to themselves, sometimes by jerks, so that the joints become strongly flexed, or one or both limbs being rigidly extended; increased reflex and electric irritability in the paralyzed limbs, provided the disease has not extended down to the roots of the nerves, but if these are involved the irritability is impaired or lost; rapid tendency to wasting of the muscles of the legs, with failure of circulation and nutrition, the skin being often covered copiously with dried epithelium scales, and bedsores being very liable to form; paralysis of the bladder, leading to retention, decomposition of urine, and consequent cystitis; paralysis of the rectum, with unconsciousness of the passage of stools; gradual loss of sexual power and inclination, though there is often reflex priapism. In rare instances the cord may become so extensively diseased as to give rise to general paralysis, with marked wasting of the muscles, and loss of electric irritability.

V. SPINAL CONGESTION.

This condition is supposed to be characterized by the sudden onset of incomplete spinal symptoms, which afterwards disappear but are liable to recur, viz., some dull aching along the spine, increased by heat, but not by movement or pressure; aching pains in the limbs, with variable paræsthesiæ, such as tingling in the toes and fingers, numbness, or sometimes hyperæsthesia, but no anæsthesia; twitchings in the

limbs, with partial loss of power in the legs or sometimes in the arms; often unequal on the two sides, there being no evident alteration in reflex irritability or in electric irritability or sensibility, or any tendency to wasting or other signs of impaired nutrition. The bladder and rectum are not involved. Slight motor and sensory disturbances accompany persistent mechanical congestion of the cord, such as that which results from chronic heart disease.

VI. SPINAL HÆMORRHAGE.

Blood may escape into the cord itself; between the membranes; or outside the dura mater. Injury is by far the most frequent cause, but occasionally a vessel gives way spontaneously.

SYMPTOMS.—1. *Into the Spinal Cord.*—This is evidenced by sudden acute pain in the back, with signs of severe shock to the system, the patient being often unconscious for the time; complete and permanent paralysis of motion and sensation in the legs or more extensively according to the seat of mischief; paralysis of the bladder and rectum; and priapism. These conditions are usually permanent. 2. *In connection with the membranes.*—If the hæmorrhage is abundant the symptoms are as above; but usually indications of sudden severe irritation are first observed, in the way of painful sensations shooting from the spine, hyperæsthesia, painful spasmodic movements in the limbs, opisthotonos, or even strong convulsive movements; followed by paralytic symptoms.

VII. ADVENTITIOUS GROWTHS IN THE CORD.

Various tumors have been found in connection with the spinal cord but cancer, syphilitic deposit, and tubercle are the most important. The usual symptoms include localized pain in the back, especially in connection with cancer; neuralgic pains shooting from this point into the limbs or trunk, due to irritation of the nerves with paræsthesia followed by anæsthesia if the cord becomes destroyed; muscular disturbance followed by paralysis, in some cases beginning on one side and extending gradually to the other. There may be objective evidences of a tumor on careful examination. If the growth is in the cord itself, there will be only gradual loss of its functions up to the level of the part involved. In the case of syphilitic disease the symptoms often improve greatly or entirely disappear under appropriate treatment owing to removal of the deposit. Signs of some cachexia may be present; or of morbid growths in other parts.

VIII. LOCOMOTOR ATAXY—TABES DORSALIS.

ETIOLOGY.—The *exciting causes* of locomotor ataxy are very obscure. It has been chiefly attributed to exposure to cold and wet, especially when combined with fatigue, as from lying on damp ground after march

ing; injury; syphilis; and venereal excess or masturbation. It is by far most common among males; and most cases occur between 35 and 50 years of age. Hereditary predisposition is said to exist occasionally.

ANATOMICAL CHARACTERS.—The lesion which gives rise to locomotor ataxy is localized mainly in the posterior columns of the cord. These undergo a peculiar degeneration which begins close to the posterior fissure, and then spreads laterally, so as partly to implicate the gray cornua. In the early stage the columns appear gray or grayish-red, semi-transparent, and softened. Microscopic examination reveals that the nerve-elements are more or less atrophied or have disappeared entirely, their place being occupied by new connective-tissue developed from the neuroglia, exhibiting abundant nuclei, fine granules, and fat, with a few granular cells. The posterior roots of the nerves also become similarly altered. The change may advance gradually upwards into the brain. In time the new tissue replaces all the nerve elements and develops into filaments, so that the cord and nerves become more opaque, much atrophied and shrunken, altered in shape, and indurated or sclerosed. The membranes covering the back of the cord are implicated in time, and its entire thickness may become diseased.

SYMPTOMS.—Locomotor ataxy develops insidiously, and runs a very chronic course. Certain premonitory symptoms are observed, which may last for months or years. These may be summed up as: 1. Sensory derangements in the legs and lower part of the body, viz., an unusual feeling of fatigue after slight exertion; painful sensations in various parts of the limbs and about the joints from time to time, supposed to be rheumatic; and also extremely severe neuralgic pains, coming on suddenly and being of momentary duration, described as darting, boring, cutting, throbbing, or like an electric shock; hyperæsthesia, dysæsthesia, or paræsthesiæ of the skin. 2. Disorders of vision, and objective changes in connection with the eyes, such as dimness of vision at times or even complete amaurosis; diplopia; slight strabismus or ptosis; atrophy of the disk or chronic neuritis. 3. Sexual derangement. It is said that sexual desire is usually increased at first. Trousseau observed that there is in the early period a peculiar aptitude for repeating sexual intercourse a great many times within a short period. Soon, however, sexual power and desire become gradually lost. Spermatorrhœa is frequently complained of. 4. Difficulty in retaining the urine in some cases, the patient being obliged to obey the call to urinate instantly; or, on the other hand, retention and inability to pass water.

When the disease is fully declared, the symptoms are very characteristic, and chiefly point to a loss of the power of co-ordination in the muscles of the legs, and of the muscular sense. At first the patient feels that he is losing control over the movements of his legs, and that

he cannot walk steadily or firmly without support, but slips about and has an uncertain gait. This is particularly noticed in the dark, and the patient finds that he has to pay special attention to the movements of the lower extremities, in order to carry them on properly. After awhile the signs of impaired co-ordination are very evident when the patient is made to walk. He is very unsteady in his movements; tends to stagger and advance precipitately; and during progression lifts the foot up to an unnecessary height, then throws it forwards and outwards and brings down the heel with a heavy stamp. On turning suddenly he staggers or falls, and the same thing happens if he shut his eyes when standing. There is no paralysis, as is proved by the fact that the leg can be easily moved in all directions in the lying posture. At last walking becomes impossible, the legs being thrown hither and thither without any appearance of design or control when any attempt at progression is made. The muscles do not waste. The condition of electrical irritability is doubtful, some affirming that it becomes much impaired others that it remains normal; in the early stage it is often exalted. Sensation is frequently much altered; the pains in the limbs continue. Cutaneous sensibility is impaired, the patient not feeling the ground properly, but having a sensation as if he were treading on wool or sand and sometimes there are spots of complete anaesthesia to all stimuli except heat and cold. Muscular sense is also more or less diminished or even lost in advanced cases, the patient not being aware of the position of his legs when lying down, unless he is looking at them. The electrical sensibility is said to be impaired in those muscles in which the muscular sense is affected. There is no loss of power over the bladder and rectum as a rule, but the former may certainly be much affected.

In some cases the ataxic condition spreads to the arms, head and neck, and trunk. Not uncommonly ptosis of one eyelid is observed and there may be more or less complete amaurosis, with atrophy of the disk. These conditions result from extension of the disease upwards so as to involve the origin of the respective nerves. Now and then there is mental disturbance. Ultimately the entire cord may become implicated, so that actual paralysis of the lower part of the body arises as well as of the rectum and bladder.

CHAPTER LXXXIV.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF ORGANIC NERVOUS DISEASES.

It will be most convenient to treat this subject as a whole, and to divide the cases into certain groups such as they are ordinarily presented in practice.

I. DIAGNOSIS.

1. The first matter to be determined in any case of organic nervous disease is whether the lesion is *cerebral*, *spinal* or *peripheral*. The general clinical characters of cerebral and spinal diseases respectively have already been pointed out, and they can usually be readily distinguished from each other if attention is paid to these. It must be remembered that the brain and cord may be involved at the same time. Peripheral disease is generally easily recognized by the localization of the symptoms, and the existence of some obvious cause to which they are traceable. Local nervous phenomena may, however, be the result of limited or commencing central disease. The use of electricity affords much aid in recognizing the seat of lesion when there is paralysis, as has been explained in a former chapter.

2. The diagnosis of affections of the brain and its membranes will next be considered.

(i.) *Acute Inflammatory Diseases.*—*a.* These have to be distinguished from various extrinsic diseases attended with severe nervous symptoms, and this particularly applies to tubercular meningitis occurring in children. The principal affections of this class with which they may be confounded are the exanthemata, especially typhoid and typhus fever; pneumonia and other acute inflammatory affections; disorders of the alimentary canal in children, particularly if acute and attended with fever and marked cerebral disturbance; anomalous cases of fever with brain symptoms; great exhaustion of the vital powers, especially as the result of bad feeding, prolonged diarrhoea, or some lowering illness; and various derangements giving rise to reflex convulsions or delirium. The history of the case, as revealing some cause of cerebral inflammation or of one of the other complaints mentioned above; the age, constitutional condition, and hereditary tendencies of the patient; the mode of onset of the attack; careful examination regarding the symptoms, particularly as to the degree and character of those referable to the head, and the presence or absence of indications of cerebral lesion in the way of motor or sensory disorder, the intensity and course of pyrexia, the symptoms connected with the alimentary canal, and those characteristic of the various fevers; physical examination of the different organs; and the course and progress of the case are the chief matters to be relied on in diagnosis. It is frequently impossible in children to determine at first whether they are suffering from tubercular meningitis or from one of the complaints above enumerated. Under such circumstances the only thing to be done is to watch the case carefully and observe its progress, at the same time employing some judicious treatment, and the obscurity will in most instances before long be cleared up. *b.* Inflammatory diseases have to be separated from other affections of the nervous system, which give rise to signs of cere-

bral excitement. Acute meningitis in an adult may be simulated by active congestion, in which, however, the symptoms are but temporary and usually slight, with little or no fever; delirium tremens; or acute mania. In the last two conditions there is rarely much difficulty, proper attention be paid to the previous history and the symptoms present. In mania the existence of one or more fixed delusions, and absence of fever or of signs of vascular excitement about the head, are important in diagnosis. In doubtful cases the supervention of spasmodic and paralytic phenomena or of coma usually soon reveals the existence of meningitis. Meningeal hæmorrhage and cerebral tumours have in rare instances been mistaken for tubercular meningitis. The symptoms of acute inflammatory softening and that due to thrombosis often closely resemble each other, and occasionally cerebral hæmorrhage simulates cerebritis at first. *c.* The diagnosis of meningitis from cerebritis and its consequences, and of simple from tubercular meningitis calls for a few remarks. Meningitis and cerebritis are frequently more or less combined, but the latter is distinguished mainly by the symptom of cerebral excitement being much less marked and of short duration or even absent altogether; while those indicative of failure of the cerebral functions rapidly supervene; there is also much less local vascular excitement and general pyrexia. The chief circumstances by which tubercular is distinguished from simple meningitis are the age of the patient in many cases; the presence of signs of the tubercular diathesis or a history of hereditary taint, and absence of any other obvious cause of meningitis; the more marked and prolonged premonitory symptoms with insidious mode of onset; the evidences of inflammation affecting the base chiefly at first, there being less psychical disturbance and no wild delirium; the headache being more in severe paroxysms; the minor degree of fever or local vascular excitement; the special characters of the pulse; and the less rapid course.

(ii.) *Apoplectic Diseases.*—These constitute a most important class of cases. The comatose condition may either be developed more or less suddenly while the patient is under observation; or he may be found in an unconscious state. The first thing to be determined in a case of insensibility of which the cause is unknown is whether this is due to syncope or shock; asphyxia; or coma. The characteristic features of each of these conditions have been already described, and need not be recapitulated here. The ordinary causes acting directly on the nervous system, which are to be borne in mind as likely to account for unconsciousness, the origin of which is not evident, are: *a.* Injury to the head. *b.* Epileptic or other form of convulsive seizure. *c.* Uræmia. *d.* Poisoning by alcohol or opium. *e.* Sunstroke. *f.* Certain organic affections of the brain or its membranes, viz., cerebral congestion hæmorrhage into the brain or meninges; embolism or thrombosis, and rapid serous effusion.

In endeavoring to arrive at a diagnosis, the following course of investigation should be pursued :

1. Inquiry must first be made as to the mode of attack, and if there is any known cause for this. Thus there may be a history of injury, opium-poisoning, or alcoholism. On the other hand, the circumstances under which the seizure occurs may exclude such causes altogether, but it is important to bear in mind that symptoms of opium-poisoning may not appear until some time after the poison has been taken. Not uncommonly, however, the patient is found in a state of insensibility, and no history can be obtained. Should this happen in a house, it is requisite in any suspicious case to look for bottles which might have contained poison. If the attack has come on under observation, it is very important to ascertain whether it arose spontaneously or followed some obvious cause, as sudden effort or a fit of anger; whether it was sudden in its onset or more or less gradual; if preceded or not by mental disturbance, local sensory or motor disorder, or other symptoms; and if any convulsive movements were observed at or soon after the beginning of the attack. This information affords much aid in distinguishing organic lesions from each other; while the occurrence of convulsions entirely excludes poisoning. The age of the patient should be ascertained, if it is known.

2. In the next place careful examination of the patient must be made, noting especially the following particulars: *a.* The apparent age; general conformation and appearance, whether full and plethoric or the reverse, and if there are marked signs of decay. *b.* The color of the face, whether indicating congestion or shock. *c.* If any signs of injury about the head can be discovered. *d.* Whether there are any indications that the attack began with convulsions, such as the tongue having been bitten. *e.* The odor of the breath, which may reveal alcohol, opium, or uræmia. *f.* The degree of insensibility, deep coma usually indicating hæmorrhage or poisoning. *g.* The state of the pupils, any inequality showing some cerebral organic lesion; while extreme contraction is a sign of opium-poisoning, though the same condition is now and then observed in cerebral hæmorrhage, while the pupils are greatly dilated at the close in cases of opium-poisoning. *h.* If there are any indications of unilateral motor disorder, looking especially for paralysis; turning of the head and eyes to one side; tremors; spasmodic movements or rigidity. These afford evidence of some cerebral lesion, though their absence does not exclude this, while marked spasm or rigidity is in favor of plugging of vessels or meningeal hæmorrhage. *i.* The characters of the breathing, slow, labored, and stertorous respiration being usually only observed in the profound coma of cerebral hæmorrhage or narcotic poisoning. *j.* The state of the pulse. It is highly important further to examine the heart and vessels. Valvular disease or some other condition likely to give rise

to embolism may be thus discovered; cardiac enlargement is often associated with cerebral congestion or hæmorrhage; in cases of thrombosis the heart is usually very weak or fatty; markedly degenerated vessels may accompany either hæmorrhage or thrombosis. The urine should also be tested, and some may be removed by the catheter if necessary. Bright's disease, however, may be associated with uræmia cerebral hæmorrhage, or thrombosis. The detection of alcohol in the urine has been considered useful in the diagnosis of alcoholic poisoning. If the patient vomits, the matters vomited ought to be examined in any doubtful case, and it may even be desirable to use the stomach pump.

3. The progress and issue of an apoplectic case often give much information as to its nature. Thus opium-poisoning and hæmorrhage on a very extensive scale, or into certain parts of the brain, soon terminate fatally. In a considerable experience of cases of alcoholic poisoning at the Liverpool Northern Hospital, I never knew one terminate fatally, even when the coma was very deep. The course of events affords important help in distinguishing between cerebral congestion, hæmorrhage, and plugging of vessels.

There are some points of practical importance which demand notice. The greatest care should be taken not to pronounce a person merely drunk in whom there are signs of this condition, as there may be at the same time some serious injury to the head, or organic lesion in the brain. Grave mistakes have not infrequently been made in this matter. Alcoholic poisoning may be met with in very young children even in infants in arms. It is sometimes difficult or impossible to determine whether comatose symptoms are due to some evident injury to the head; or to a sudden cerebral lesion, which has caused the patient to fall, and has thus led to the injury.

(iii.) Another group of cerebral cases is characterized by sudden or rapidly-developed hemiplegia, without loss of consciousness. This indicates either hæmorrhage into the brain, or plugging of vessels, especially from thrombosis. The probability is always in favor of the latter, and the diagnosis is still more certain if the paralysis is not suddenly complete, but increases and extends in a progressive manner.

(iv.) *Chronic Organic Affections of the Brain and Meninges.*—Not uncommonly head-symptoms are complained of more or less constantly such as headache or giddiness, and it becomes a question whether these depend upon some extrinsic disturbance, especially connected with the digestive organs, heart or kidneys; or upon some morbid condition of the brain, such as congestion or disease of the vessels. It is always well to give a cautious opinion under these circumstances. The general condition of the patient; presence or absence of marked symptoms referable to the alimentary canal; state of the heart, vessels, and kidneys; and the precise nature of the symptoms complained of will

usually render the diagnosis apparent. Any sensory or motor disorder in the limbs, especially if always noticed on one side or fixed in the same spot, should be looked upon with suspicion.

The principal chronic cerebral diseases between which a diagnosis has to be usually made are *chronic meningitis*; *chronic softening*; and *tumor*. It must be remembered that these are often associated, when their symptoms are more or less combined. The chief points to be considered in the diagnosis are: 1. The history of the case, as revealing some local cause of meningitis or a syphilitic taint; or the absence of any such cause. 2. The age and general condition of the patient, with the state of the main organs and vessels, softening being generally accompanied with signs of marked degeneration, and occurring in old persons or in those prematurely aged. There may be signs of some constitutional taint associated with tumor; or of morbid deposits in other parts, especially cancerous, tubercular, or syphilitic. 3. The seat, intensity, and characters of headache. 4. The mental condition, meningitis being chiefly characterized by excitement alternating with depression; softening by gradual and permanent impairment of the mental faculties; while in cases of tumor the mind is often quite natural. 5. The character and mode of distribution of sensory and motor disturbances. These have been pointed out in the description of the symptoms of each disease, and they are very important. 6. The appearances revealed by the ophthalmoscope. Occasionally there are external objective signs of tumor. As to the nature of a growth in the brain, it is often impossible to come to any certain conclusion. Some indications may be derived from the age of the patient; a history of syphilis; signs of a particular cachexia; or the presence of morbid growths in other parts.

Epileptiform seizures may occur in the course of the diseases just considered. These can generally be distinguished from true epileptic fits by their irregular character; and by the existence of definite symptoms indicative of one or other of these morbid states.

The difference between *chronic hydrocephalus* and *hypertrophy of the brain* in children, each of which causes enlargement of the head, have been sufficiently pointed out in their several descriptions.

(v.) The determination of the exact seat of any organic lesion in connection with the brain or its membranes is often very difficult, requiring careful consideration of all the clinical phenomena observed. The ophthalmoscope often affords much aid; and Dr. Gowers has drawn my particular attention to the necessity of testing the field of vision in order to localize a cerebral lesion. For instance, partial double hemiopia is often present when unsuspected by the patient. This shows disease of the optic fibres on the side opposite to the hemiopia behind the commissure; or of their terminations in the central ganglia, corpora geniculata, or optic thalamus. Hence when other nervous symptoms

are bilateral, this hemiopia may afford the only indication as to the side which is affected, and it may be the means of still further localizing the mischief to that part of the hemisphere which is contiguous to the optic tract and ganglia. If the lesion is situated in the commissure itself, which is very rare, the loss of vision is not on the same side in both eyes, but the two outer or two inner fields are lost.

4. *Diseases of the Spinal Cord and its Membranes.*—The diagnosis of spinal affections needs but brief notice. Acute spinal meningitis may be mistaken for tetanus; spinal congestion; or spinal irritation; but there is rarely any difficulty in separating them. Myelitis is distinguished from meningitis by the absence of symptoms of irritation; with rapid development of signs of destruction of the cord and failure of its functions. Chronic affections of the cord may be simulated by hysterical or reflex paraplegia. The characters of the former have been already pointed out. In reflex paraplegia some cause can be discovered; the paralysis is in proportion to the intensity of this cause, and is generally partial and incomplete; there is no wasting of muscles; sensibility is usually normal; and the bladder and rectum are but little or not at all affected. The paralysis disappears if the cause is removed. Chronic softening is as a rule easily recognized by the local sensations, and permanent paralytic and other symptoms. Syphilis is a most important cause of spinal disease, and where there is a history of a syphilitic taint treatment directed against this condition should always be had recourse to, when the symptoms, if due to syphilitic deposit, are either greatly improved or entirely got rid of. The signs of other adventitious growths, hæmorrhage, and other rarer morbid conditions have been sufficiently indicated in the descriptions already given. Locomotor ataxy is usually easily recognized by the history of the case; and the signs of loss of co-ordinating power, without paralysis.

II. PROGNOSIS.

1. Any acute inflammation in connection with the brain or its membranes is extremely dangerous, and in the great majority of cases the termination is fatal. It is exceedingly doubtful whether tubercular meningitis is ever recovered from, at all events when the disease is fully developed. If a case should terminate favorably, the cerebral functions are permanently impaired more or less.

2. The immediate prognosis of an apoplectic seizure due to cerebral lesion is always doubtful, and a very cautious opinion ought to be given, the case being thoroughly watched. If the coma is merely due to congestion, the patient will soon recover. The chief circumstances which increase the gravity of the immediate prognosis in cases of sanguineous apoplexy are: advanced age of the patient, with very degenerate vessels; a history of previous attacks; the occurrence of convul-

sions at the outset, or of marked rigidity or spasmodic movements at an early period; a progressive character of the attack; very deep and prolonged coma, with involuntary passage of urine and fæces; general paralysis; great dilatation and immobility of the pupils, or extreme contraction; a very slow or rapid pulse; signs of profound shock, with feeble circulation, pallor, and cold sweats. As to the ultimate prognosis, supposing consciousness to be restored, this can only be determined by watching the case for some time and noting its progress; and the same is true when hemiplegia sets in without coma. Right hemiplegia is said to be less favorable than left. Anæsthesia in any part of the paralyzed limbs is a bad sign, as well as the occurrence of occasional severe pains. If no improvement is evident within a month; if the paralyzed limbs exhibit a marked tendency to permanent rigidity; and if electric irritability becomes impaired or lost, the prognosis is very unfavorable. The leg may recover power while the arm remains permanently paralyzed. After hæmorrhage the mental faculties are often perfectly restored even though the paralysis is persistent. It must be borne in mind that a clot in the brain may cause serious inflammation of its substance, and thus prove fatal some time after the occurrence of the hæmorrhage.

Embolism or thrombosis is not so frequently immediately fatal as hæmorrhage, but the subsequent history is generally very unfavorable, both as regards the mental condition and the paralysis, especially in cases of thrombosis accompanied with extensive disease of the vessels, these often going on rapidly from bad to worse.

3. In chronic brain-affections the prognosis is very uncertain. All that can be said is that any such affection is always serious, and that at any moment dangerous symptoms are liable to arise, which may end in speedy death. If the disease is due to syphilis, however, much improvement may often be effected by proper treatment. If there are indications of frequent or constant disorder of the cerebral circulation, along with degeneration of the vessels, the danger of the supervention of hæmorrhage or thrombosis should be recognized.

4. Acute inflammation of the cord or its membranes is very grave, and often proves rapidly fatal, but myelitis may remain as a chronic affection. Once the cord is destroyed by any acute or chronic lesion, permanent paralysis is established in the parts below the seat of mischief, but cases of this kind frequently linger on a long while, and the patients may be in a condition of good general health. Bed-sores, cystitis, and other untoward complications are, however, very liable to arise. Symptoms due to syphilitic disease of the cord improve remarkably in many cases under appropriate treatment. Locomotor ataxy is not usually amenable to treatment when fully established, but in recent cases much good may be done. Its progress is very slow.

III. TREATMENT.

1. *Acute Meningitis and Cerebritis*.—Unfortunately dire is of very little service in these diseases, and my own experience in a good number of cases at the Liverpool Northern Hospital opposed to the measures usually recommended by some writers, viz., bleeding, severe purging, mercurialization, and emetic. The measures which are most likely to be useful in the early stage are to place the patient in a well-ventilated, cool, quiet, and somewhat darkened room, on a comfortable bed, with the head elevated, and to enjoin perfect freedom from every kind of disturbance; to keep the patient very short or even shave the head, and apply cold assiduously by means of the ice-bag or irrigation; to open the bowels freely, a dose of calomel or croton oil being useful for this purpose, as well as enemata; to limit the diet to beef tea and milk; to watch for signs of vascular excitement, to apply a few leeches to the temples. Convulsions are best treated by bromide of potassium in small doses, especially in cases of tubercular meningitis. Opium is to be avoided. In the later stages a blister may be applied to the neck, or a couple behind the ears, but the advantage of blisters over the whole scalp, as has been advocated, seems to me very doubtful. Should symptoms of adynamia set in, stimulants are needed, such as brandy, ammonia, and ether, with abundant liquid nourishment. If the patient is unconscious, they may be injected between the teeth by means of a syringe, or administered by enemata. Care must be taken throughout to keep the feet warm, to attend to thorough nursing, and to see that the bladder is properly emptied. Sinapien blisters over the limbs are recommended in order to enjoin rest, but the patient in the later stages, but they are of little use. In cases of meningitis arising in connection with rheumatic fever, applications of sinapien or blisters to the joints might be of service.

2. *Apoplectic Diseases*.—Here it is only intended to give the principles of treatment of an apoplectic attack from some organic cerebral disease, but I would remark that in cases where the diagnosis is uncertain, it is desirable to empty the stomach at once by means of the stomach pump, at least the symptoms should be due to some poison. In this case the first principle in treatment ought to be not to interfere with the patient, and actively unless there is some clear indication for such interference. Formerly venesection was at once resorted to, and is now it is followed as a routine practice. In many cases all that is required is to place the patient in the recumbent posture, if possible with the head high; to loosen all clothing about the neck and chest, to admit plenty of fresh air; and enjoin perfect quiet. If the attack is due to congestion, recovery will soon follow. Should there be any hæmorrhage, with obvious signs of marked plethora, un-

venesection may be useful, but it is rarely needed; on the other hand the condition is not uncommonly one of shock, and then stimulant enemata, heat and sinapisms to the extremities, and similar measures are indicated, particularly when the coma is due to plugging of vessels. The practice of placing a drop or two of croton oil on the tongue is useful in many cases. If the comatose state continues for a considerable time, the patient must be supported by enemata, sinapisms may be applied to various parts, and the bladder must be attended to. If consciousness returns, the patient should be kept completely at rest, free from all mental disturbance, and upon low diet, until the period of danger from inflammation has passed. Should this morbid condition be set up, the hair may be cut short and cold applied, or small blisters. The subsequent treatment of these cases, as well as of those of sudden hemiplegia without coma, must depend upon their progress. The main indications are to support the general health, especially by proper diet, attention to hygienic conditions, and tonics; to avoid all forms of mental disturbance; and to treat symptoms, particularly paralysis, which must be managed according to the principles already pointed out. Iodide of potassium and bichloride of mercury have been supposed to aid in the absorption of a clot. A blister occasionally applied to the nape of the neck may prove serviceable.

3. *Chronic Cerebral Diseases*.—The principles of treatment in these affections are very simple, viz.: *a.* To keep the mind free from every possible excitement or anxiety, and forbid any mental labor; in short, to keep the brain as much at rest as possible. *b.* To support the general health by good food, fresh air, quinine, iron, cod-liver oil, and hypophosphites. *c.* To aid absorption of morbid products. Iodide of potassium, bichloride of mercury, and gray powder are the chief drugs employed in cases of chronic meningitis, but they are especially important in syphilitic disease. Occasional blisters are supposed to promote absorption. *d.* To treat symptoms, especially headache, paralysis, restlessness, and sleeplessness, by means of hyoscyamus, cannabis indica, or chloral; and convulsive seizures by bromide of potassium. Acute symptoms may arise calling for active interference. For chronic hydrocephalus diuretics are recommended, with the view of aiding absorption of the fluid. Pressure around the head by means of a bandage or strapping, and removal of the fluid by a fine trocar or the aspirateur, have also been employed.

4. *Spinal Diseases*.—In acute inflammations affecting the spinal cord, the patient should be kept at rest, lying on the side or in a somewhat prone position. Ice may be applied constantly along the spine. In some cases the application of leeches over this region is useful. Medicines are of doubtful value. Dr. Radcliffe recommends iodide of potassium with opium in spinal meningitis. When the cord is involved, belladonna, conium, and ergot are believed to exercise a direct beneficial

effect upon it. It is particularly important to attend to the bladder and bowels in cases of disease of the cord; to see that the patient is kept clean and dry; and to guard against bed-sores, for which object a water bed is very valuable. This applies more particularly to chronic affections, in which all that can be done further is to support the general health by good food, proper hygienic conditions, and tonics, especially quinine, iron, and preparations of phosphorus; to promote absorption of morbid products, particularly syphilitic deposits, by the aid of iodide of potassium and bichloride of mercury; to stimulate the functions of the cord by minute doses of strychnia; and to treat the paralysis. Cases of locomotor ataxia have been benefited by electricity and large doses of iodide of potassium; at the same time making use of means for improving the general health.

CHAPTER LXXXV.

ON CERTAIN SPECIAL NERVOUS DISEASES.

I. PROGRESSIVE MUSCULAR ATROPHY—WASTING PALSY— CRUVEILHIER'S PARALYSIS.

ETIOLOGY AND PATHOLOGY.—Wasting palsy has been attributed pathologically to an atrophic and degenerative change beginning in the involved muscles themselves; in the anterior roots of the nerve supplying them; or in the spinal cord, but there is no certainty with regard to this matter. The chief supposed *exciting causes* are exposure to cold and wet; a blow or fall on the neck or back; and excessive use with consequent fatigue of muscles. The disease occurs by far more commonly in males, and usually in persons about 30 years of age, though it may be met with from childhood to old age. In some cases it appears to be hereditary, or to affect several members of the same family.

ANATOMICAL CHARACTERS.—The affected muscles are wasted more or less, pale and yellowish, soft, the muscular fibres being replaced by granular, fatty, gelatinous tissue, through which the tendons pass. The muscles are altered to a very variable degree, and one may be found quite gone while that next to it is unchanged, or healthy bundles of muscular tissue may be seen in the midst of the morbid material. The upper portions of the muscles are usually most changed. The anterior roots of some spinal nerves and the sympathetic branches joining them have been found atrophied, the nerve-elements being replaced by

finely-granular tissue. Similar changes have also been noticed in the posterior columns of the cord and posterior cornua of the gray matter, along with thickening and granular degeneration of the vessels, though the cord may appear healthy to the naked eye.

SYMPTOMS.—Wasting palsy sets in very insidiously. It usually begins in either shoulder or hand, especially in the right deltoid, but gradually advances from its starting-point so as to invade other muscles, until finally every voluntary muscle in the body may be involved, except those of the eyeballs and eyelids, and the muscles of mastication. Occasionally the muscles of the neck are first implicated, and rarely those of the face. There is loss of power, corresponding in situation, extent, and degree to the wasting, and this may culminate in absolute helplessness, with inability to swallow, speak, or breathe, death then resulting from asphyxia. At the same time there are marked objective signs of the atrophy of the muscles, which are well seen about the shoulders and in the hands, the latter assuming the “claw-hand” shape, characterized by deep depressions due to the wasting of the muscles, while the tendons stand out and the fingers are drawn in towards the palm, being also pushed back; the ball of the thumb is much wasted; the shoulder is flattened or depressed, and the bony prominences seem to stand out. The tissues have a soft, flabby feel. The face assumes a vacant, idiotic expression when its muscles become affected. During the progress of wasting the muscles present constant flickering movements so long as any muscular tissue is left, which are more marked if the skin is exposed to cold or blown upon. The irritability and force of contraction under electricity become diminished in proportion to the waste of tissue. The mind is unaffected to the last. Pain may or may not be complained of in the affected parts. There is never any loss of power over the bladder or rectum, and the heart is never implicated. In some cases the disease does not spread to the extent above described, but is arrested in its progress, the patient ultimately recovering, especially when it is due to fatigue of special muscles.

DIAGNOSIS.—The conditions which are liable to be mistaken for progressive muscular atrophy are paralysis from local injury or disease of a nerve; chronic lead-poisoning; essential paralysis; and general paralysis of the insane. Attention to the history, symptoms, and mode of progress of the complaint will generally make the diagnosis evident.

PROGNOSIS.—Improvement can often be effected by early treatment, but in advanced cases very little can be done, especially if the disease is extensive and rapid in its progress. The prognosis is more favorable when the complaint is due to fatigue; while it is worse if any hereditary tendency is evident.

TREATMENT.—If wasting palsy has arisen from excessive use of certain muscles, these must be allowed to rest. Improvement of the general health is highly important, by means of nutritive diet, tonics, change

of air, and gentle regular exercise. Warm or sulphur-baths have been recommended, but cold baths should not be used. The chief methods of treatment are systematic friction, for which some stimulant may be employed; passive motion; and electricity. The continuous and interrupted currents are both serviceable, and their severing use proves often very beneficial. According to Duchenne "the more a muscle is atrophied and its contractility diminished, longer it should be subjected to the stimulation, the more intense should be the current, and the more rapid its intermissions. When sensibility is seen to return, it is prudent to diminish the intermissions and abate the intensity of the current." Pain may be subdued by warm fomentations or baths, or, if it is severe, by the hypodermic injection of morphia.

II. ESSENTIAL PARALYSIS OF CHILDREN—INFANTILE PARALYSIS

ETIOLOGY.—The causation of infantile paralysis is but little understood. The complaint occurs in the large majority of cases between 2 months and 3 or 4 years of age, but may be met with in patients from 2 months to 8 years old. Sex and constitutional condition have no influence. It sometimes follows one of the acute exanthemata, but has also been attributed to painful dentition; injury to the back; cold from lying on damp ground; and digestive derangements.

ANATOMICAL CHARACTERS.—After the disease has lasted for some time, the affected muscles are not only atrophied, but also present signs of fatty degeneration. Infantile paralysis seems to be the result of some lesion in connection with the spinal cord, but it is by no means clear what this lesion is. Many have denied that there is any special alteration, while others have described spinal congestion, or even hæmorrhage into the cord. In prolonged cases the antero-lateral columns and anterior roots of the nerves have been found to be the seat of atrophy and distortion for a variable extent, the nerve-cells having disappeared, and the neuroglia become hypertrophied.

SYMPTOMS.—The invasion of infantile paralysis is usually indicated by some premonitory symptoms, especially pyrexia, generally not very marked and exhibiting remissions, which lasts from 24 to 48 hours, sometimes by convulsions, not involving the face, and unattended with cerebral symptoms. In exceptional cases mental excitement, delirium or loss of consciousness is noticed at the outset, or the paralysis may come on suddenly without any warning. At first the paralysis is often more or less general, affecting both sides, but usually the lower limbs more than the upper, so that the child lies quite helpless; in other instances it is limited to one or more of the limbs. The implicated muscles are relaxed. Sensation is not perceptibly affected as a rule, but older children may complain of pains in the limbs and back, and there may

be some numbness, which, however, soon disappears. The sphincters are not involved. Reflex excitability is impaired or abolished, but electric irritability seems to be retained. In rare instances the paralysis disappears entirely in a few days, and the patient is completely restored. The ordinary course of events is for some of the limbs or muscles to recover in from two or three days to a fortnight, while others remain permanently paralyzed. The permanent paralysis is generally of paraplegic distribution, though one leg is more affected than the other; in exceptional cases it is hemiplegic, or a leg and an arm may be implicated on opposite sides, or the paralysis may be confined to one limb, or a part of it. Subsequently the paralyzed parts become atrophied and stunted in their growth; electric irritability is entirely lost; all their tissues undergo degeneration; the pulse becomes small and the circulation languid; the temperature falls considerably; and various deformities and distortions arise, according to the part involved, such as club-foot, flexion of the hips, etc. Those who have been subjects of infantile paralysis often live to an advanced age, and many belong to the class of mendicant cripples.

DIAGNOSIS.—Until the paralysis sets in there is nothing distinctive about this complaint, but at this time its symptoms are sufficiently characteristic. In very young infants it may be difficult to make out the paralyzed condition. The diseases which might possibly be mistaken for infantile paralysis are meningeal hæmorrhage; paralysis following diphtheria; myelitis; and tumors or other morbid conditions of the brain.

PROGNOSIS.—Caution is always necessary in giving an opinion on this point. Recovery is often brought about by appropriate treatment, if commenced early and persevered in. The prognosis is worse in proportion to the intensity of the initiatory fever; the loss of power; degree of wasting; and impairment of electric contractility. So long as electro-contractility remains improvement may be anticipated, but if this is quite extinguished a cure is impossible.

TREATMENT.—In the premonitory stage nothing need be done except to keep the patient in bed, and watch the progress of events. When the paralysis is evident, the important measures to be adopted are daily friction of the affected parts with olive oil or some stimulating liniment; passive movements, or, if the patient is old enough, active movements; and the persistent use of electricity. The continuous current of fair strength should be applied to the affected muscles for 10 or 15 minutes twice daily; and after a time a weak induced current may be employed. Gymnastics and mechanical appliances must be had recourse to in order to prevent or make up for deformities. Operations may also be required. The general health should be supported by nutritious diet, change of air, baths, cod-liver oil, iron, strychnine, and similar remedies.

III. WRITER'S CRAMP—SCRIVENER'S PALSY—MOGIGRAPHIA

ETIOLOGY AND PATHOLOGY.—The form of nervous disorder thus named is but one of a group in which sets of muscles habitually and frequently exercised for certain complicated actions become the seat of peculiar spasmodic movements. It occurs principally among those who write a great deal, such as teachers, merchants, and clerks, but similar derangements are met with in connection with other occupations, such as amongst violinists, pianoforte players, watchmakers, engravers, seamstresses, milkmaids, shoemakers, and nailsmiths. Overwork of the affected muscles seems to be an important element in the causation of the malady, and it is aggravated by mental worry and anxiety. Amongst writers the use of a steel-pen, the wearing of a tight coat-sleeve, and an inconvenient and constrained attitude have been considered as predisposing causes. Writer's cramp never occurs under 30 years of age and is far more frequent among males than females.

The pathology of writer's cramp is very doubtful, but the affection has been attributed to a morbid condition or malnutrition of the nerve-centre governing the implicated muscles, with consequent diminution in nerve-force, or loss of co-ordinating power; to chronic fatigue of these muscles; to a reflex neurosis from muscular nerves; or to a faulty transmission of voluntary impressions to other motor nerves besides those which are intended, sympathetic movements being thus excited.

SYMPTOMS.—The earliest symptom in most cases of writer's cramp, which may be taken as a type of all similar diseases, is a sense of fatigue and aching in the hand after writing, especially in the thumb as well as often in the muscles of the upper extremity. The patient finds that he must hold his pen more firmly, and give more mental attention to the act, in order to write properly. This only aggravates the mischief, however, and in time control over the muscles concerned in the act becomes diminished or lost, so that irregular spasmodic movements are excited in the fingers and thumb whenever any attention at writing is made. The thumb may be convulsively flexed, the pen getting over its knuckle; the index-finger is jerked; or the first three fingers exhibit disorderly spasmodic movements. Of course the writing is more or less altered, and ultimately becomes mere illegible scribbles. The patient learns to alter his mode of writing, using the hand, wrist, elbow, and shoulder in succession, but as he does so the corresponding muscles present similar spasmodic movements. Then he takes to writing with the left hand, which becomes affected in the same manner.

The symptoms just mentioned are intensified by mental excitement and by anxiety on the part of the patient to write properly. They cease immediately the attempt to perform this act is given up, and other actions can be carried on without any difficulty or disorder. In some cases a dull pain is experienced in the muscles of the limb, or

feeling of weight and tightness; sensation, electric irritability, and nutrition are in no way impaired. In exceptional cases headache, vertigo, mental dulness, occasional tremors, or other nervous symptoms are observed. The general health is usually good, but the patient is liable to be depressed in spirits.

DIAGNOSIS.—There is but little difficulty in recognizing the disease now under consideration, if attention is paid to the occupation of the patient, and the peculiar course of symptoms above described. It might possibly be mistaken for wasting palsy, or the effects of chronic lead poisoning.

PROGNOSIS.—If the condition has only existed for a short time, a cure may be expected under appropriate treatment; but in cases of long duration the prognosis is most unfavorable.

TREATMENT.—All attempts to check the progress of writer's cramp by using quill pens, altering the mode of writing, employing douches and friction, and such measures, are quite ineffectual, and an essential part of the treatment consists in absolute and prolonged rest from the particular employment which is the cause of the complaint, or, if possible, it should be given up altogether. The regular use of the continuous current has proved serviceable, applied to the muscles and nerves of the arm, and along the spine. Dr. Poore employs it along with voluntary movements of the muscles. When nothing can be done in the way of improvement, patients can sometimes manage to write by using some special apparatus.

IV. PSEUDO-HYPERTROPHIC MUSCULAR PARALYSIS—DUCHENNE'S PARALYSIS.

ETIOLOGY.—The *exciting causes* of this peculiar affection are quite obscure. Pathologically it has been attributed to some lesion of the motor and trophic nerve-cells in the cord, and has been considered to be the same disease as progressive muscular atrophy. It commences almost always during infancy or early childhood, and is by far most common in boys. In exceptional cases the disease begins in adults. Hereditary predisposition is supposed to exist occasionally.

ANATOMICAL CHARACTERS.—The obvious changes are associated with those voluntary muscles which are affected, these being increased in size and very firm, while they present important structural changes, the muscular fibres having to a great extent disappeared, many of those which remain being atrophied or in a state of degeneration, while the great mass of the apparently enlarged muscles is made up of fat and fibrous tissue, the latter being partly the remains of the sheaths of the muscular fibres, partly the result of proliferation. In advanced cases other muscles are simply atrophied. Many observers have been unable to detect any morbid condition of the spinal cord, but extensive de-

generation of the central gray matter and anterior commissure, as well as other changes, have been described by Lockhart Clarke and Gowers.

SYMPTOMS.—Pseudo-hypertrophic muscular paralysis is a very chronic disease, and its progress has been divided into certain stages, the duration of which presents much variation. The muscles first affected are those of the legs and back, especially those of the calves, back of the thighs, and gluteal regions, and the erector spinæ. At the outset they are merely weak, which may be noticed when the child begins to walk. Subsequently they increase in size, and then the characteristic symptoms become evident. These are: 1. Enlargement and unnatural firmness of the calves, back of the thighs, and lumbar region. 2. Peculiarities in the attitude. When standing the patient is evidently unsteady and keeps the legs wide apart, with the heels raised; the shoulders are thrown back and the antero-posterior curve of the spine is much exaggerated, so that the abdomen appears peculiarly prominent, but this prominence subsides in the sitting posture. 3. Peculiarities affecting the mode of progression and movements. In walking the legs are almost much separated, the patient supports himself almost on tiptoe, and the body is balanced, first on one leg and then on the other, with a kind of waddling movement. The patient easily stumbles or falls, especially when attempting to walk rapidly, and soon becomes tired. Stooping is easily effected, but it is very difficult then to gain the erect posture, except when the patient is sitting down.

In course of time the muscles of the upper part of the trunk, of the arms, or even those of the face become involved. These may be also evidently enlarged, but more commonly wasting of the upper part of the body is observed, contrasting with the enlargement of the lower portion. The paralysis becomes more marked and extensive, and ultimately the patient lies in a completely helpless condition, at the same time the formerly hypertrophied muscles undergoing wasting. The mental faculties may become impaired, and headache, disorders of vision, and other evidences of cerebral disturbance may be noticed before the close. Death results from gradual exhaustion; implication of the respiratory muscles; or some intercurrent malady.

Very different statements have been made as to the electric contractility of the affected muscles. It is probably usually impaired to some extent by induced current, but has been found increased as regards the primary current. Portions of the diseased tissue may be removed for examination during life, by means of Duchenne's trocar.

DIAGNOSIS.—In a well-marked case there is no difficulty in recognizing this disease. It might possibly be mistaken for true muscular hypertrophy, or spinal disease.

PROGNOSIS.—This is usually very unfavorable. Instances of recovery in the early stage have been reported, and improvement has been

effected in more advanced cases, but these are exceptions. Life may be prolonged for many years.

TREATMENT.—No drug has any direct influence upon Duchenne's paralysis. Tonics may be of some service. The only measures from which any benefit can be expected are shampooing and kneading; cold douching; and the use of electricity. Local faradization of the affected muscles is of much use, and the application of the primary current along the spine and sympathetic nerve has also been recommended.

V. SCLEROSIS OF THE NERVE-CENTRES.

Sclerosis of the brain and spinal cord has attracted considerable attention of late years. This morbid condition may be variously distributed through these nerve-centres, and the clinical phenomena differ accordingly, but it appears more convenient in this work to offer a few general remarks on the subject. I have gathered my information principally from Dr. Hammond's treatise on Diseases of the Nervous System. The chief varieties may be enumerated as: 1. Diffuse cerebral. 2. Multiple cerebral. 3. Multiple cerebro-spinal. 4. Spinal. The last mentioned has been further subdivided, as will be presently pointed out.

ETIOLOGY.—Age seems to have considerable influence as a predisposing cause of the various forms of sclerosis, and in most cases they commence respectively at the following periods of life: Diffused cerebral during infancy; multiple cerebral from 50 to 60; cerebro-spinal from 40 to 50; spinal from 35 to 45 or 50. Males suffer in much larger proportion than females. Hereditary predisposition is traceable in some cases, if not to the actual disease, to some other form of nervous disorder. The *exciting causes* are very obscure, and in many cases cannot be made out in the least. The cerebral forms have been attributed in different instances to hæmorrhagic cysts; injury to the head; acute fevers, especially typhoid and scarlatina; rheumatism or syphilis; dissipation; severe emotional disturbance; excessive mental application; great muscular exertion. The spinal varieties have been supposed to be the result of previous inflammation of the cord or its membranes; injuries to the spine; straining, or the constant maintenance of a bent position; sexual excess; exposure to cold; gout, scrofula, or syphilis; abuse of alcohol.

ANATOMICAL CHARACTERS.—Sclerosis consists essentially of hyperplasia of the neuroglia, with coincident atrophy and disappearance of the nerve-elements. The process is looked upon by many pathologists as being of an inflammatory nature. The affected part presents various degrees of increased firmness and density, being in many cases very hard and tough. At the same time it is condensed and contracted within its normal limits, as well as altered in color, being white, gray-

ish-white, or yellowish-gray. Microscopic examination reveals the elements of the neuroglia, with the débris of nerve-tissues.

The morbid condition is differently distributed in the various forms of the disease. In diffused cerebral sclerosis a large portion or the whole of a lobe is involved, or sometimes even the entire hemisphere and the lesion is not circumscribed. It becomes less marked at its circumference and never invades the gray substance of the brain. Multiple cerebral sclerosis is characterized by the dissemination of well-defined plates or nodules through different parts of the brain. They vary considerably in number; range in size from that of a cherry-stone to a walnut; and seem to be most frequent in the ganglia of the cerebral hemispheres, but may involve other parts, such as the medulla, pons, cerebellum, crura cerebri, etc. In cerebro-spinal sclerosis the deposits are scattered through both the brain and cord. When the morbid condition is confined to the spinal cord, it may be diffused uniformly through more or less of its length; assume the form of disseminated and multiple points of sclerosis; or be confined to its cortical portion. Further, the disease may involve the cord throughout its entire circumference; or be confined to its antero-lateral or posterior columns. The roots of the nerves are also often implicated at the same time.

SYMPTOMS.—The clinical history of cases of sclerosis of the nervous centres must necessarily differ according to the seat, extent, and mode of distribution of the disease, and it will be requisite to describe each chief form separately, though it must be remembered that these all present numerous variations. The ultimate effect of the morbid process is seriously to impair or completely abolish the functions of the part involved, though during its progress signs of irritation may be evident.

1. *Diffuse Cerebral Sclerosis.*—In this variety the mental faculties either remain undeveloped to a variable degree, or become impaired. The disease sets in later in life. The patient never learns to talk, speech becomes imperfect or lost after it has been acquired. Usually more or less hemiplegia is observed, with arrest of growth, contraction and distortions of the affected limbs, in which sensation may be also impaired. One or more of the special senses are usually enfeebled or lost. Many of the patients suffering from this complaint belong to the class of idiots or imbeciles, whose habits are filthy, and who pass the excretions involuntarily. Frequent attacks of epileptiform convulsions are not uncommon during the progress of the lesion, with signs of cerebral irritation at the early period. The progress is very chronic, as patients often live to an advanced age.

2. *Multiple Cerebral Sclerosis.*—It will be readily understood that the symptoms are liable to present considerable modifications in disseminated sclerosis, but the most frequent phenomena are such as have been described as characteristic of one form of paralysis agitans.

Hammond describes a typical form of the disease, in which the cerebral hemispheres are mainly involved, of which the following is an epitome: the progress is almost invariably slow, and in the early stage the chief symptoms are sharp paroxysms of pain in the head, of short duration, with occasionally a permanent feeling of fulness or constriction; and disorders of sensation in other parts, such as hyperæsthesia, numbness in the fingers or toes on one side, or sometimes darting pains like electric shocks. In exceptional cases an epileptic seizure reveals the disease. Motor disturbance is first indicated by tremors or trembling, which may not be observed for a considerable time. The tremors generally begin in a limb, involving it throughout, or being limited to groups of muscles, or even to a single muscle. Sometimes they commence in other parts, such as the head or eyelid. Their usual tendency is to become more intense and to extend gradually and in a lateral order, so that ultimately all the limbs may become implicated, as well as in many cases the head, eyelids, eyeballs, lips, muscles of the lower jaw, tongue, or perhaps even those of the pharynx or larynx. At first the trembling may only be noticed when the patient is quiet and his attention is not occupied. It is not merely set up when voluntary movements are performed, and is for a long time to some extent under voluntary control, though undue effort to restrain it may have the contrary effect. A change of posture often quiets the movement for a time. Emotional disturbance of any kind increases it. For a considerable time it ceases during sleep, but finally becomes constant. In exceptional cases the tremors commence as violent paroxysms, which the patient cannot restrain, and these increase in frequency until they become permanent.

After a variable interval paralysis gradually sets in, this symptom usually following the tremors, and taking the same progressive course, except in the muscles of the face, where it may arise independently. Ultimately the loss of power may terminate in hemiplegia or general paralysis, the muscles of the head, trunk, face, and eyes being involved, as well as those of deglutition, speech, and respiration. Contractions and distortions of the limbs may follow, especially of the upper extremities. Inability to maintain a continuous muscular contraction, and impairment of the power of co-ordination are prominent symptoms. The patient also loses the knowledge of the situation of the different parts of the body. Electric contractility is not impaired. The attitude and gait become peculiar. "In standing the body is generally inclined forward, the head falling towards the chest, the trunk flexed at the pelvis, and the knees slightly bent. In walking the action is similar to a jog-trot, the body being still inclined forward, and the patient often moving with considerable rapidity." There is in many cases a strong tendency to plunge forward, causing the patient to seize upon some fixed object; hence it is easy to ascend a staircase, but difficult

to descend. This peculiar mode of progression is termed "festination." Sometimes the tendency is to go backwards.

As the disease progresses, disorders of sensation become more marked, and the special senses are more affected. White atrophy of the disk is revealed in many cases on ophthalmoscopic examination.

In the last stage the patient becomes quite helpless, and unable to speak or swallow, the constant tremor causes abrasion of the skin, sleep is prevented, urine and feces are passed involuntarily, the mind is enfeebled, and death ensues from gradual exhaustion, coma, or convulsions. The average duration is about five years.

3. *Cerebro-spinal Sclerosis*.—This variety is particularly liable to irregularity and want of uniformity in its symptoms. These are in many respects similar to those just described, but they present some peculiarities. Sometimes the disease begins in the brain, and the phenomena point to this organ as being the seat of mischief; but generally the cord is first involved, and in most cases spasmodic jerking and twitchings of the limbs are first observed, owing to inflammation or congestion of the spinal meninges. The peculiar features of cerebro-spinal sclerosis are that paralysis is usually noticed before the tremor while the latter is only evident when a voluntary movement is made. The legs are generally much more paralyzed than the arms, and the feet are very liable to bed-sores. Ultimately the condition becomes much the same as in multiple cerebral sclerosis, but the mind in the great majority of cases remains clear to the last, the hemispheres not being often involved.

4. *Spinal Sclerosis*.—One form of sclerosis of the spinal cord has been already described, viz., locomotor ataxy. It is unnecessary to discuss at any length the symptoms resulting from the different mode of distribution of the morbid condition through the cord. In the early stage there may be signs of meningeal irritation, in the way of muscular twitchings and jerking, with pains shooting from the spine. The indications of gradual destruction of the functions of the part affected are observed, varying according to the upper limit of the disease. When the antero-lateral columns are involved, paraplegia is developed by degrees, or the paralysis may extend more or less up the body, or even to the arms. The gait often becomes peculiar. Reflex and electric contractility are usually increased. Tremor is never observed unless the disease extends to the brain, but the paralyzed parts are liable to muscular fibrillary contractions, or to twitchings or jerking of the limbs. The muscles often waste. The bladder and rectum are usually implicated, but not necessarily. Deglutition and respiration become affected when the disease is situated high up in the cord.

DIAGNOSIS.—The different forms of sclerosis have to be distinguished in the first place from other diseases; and, secondly, from each other. The chief diseases for which they may be severally mistaken are a

follows: *Diffused cerebral* for simple atrophy of the brain; cerebral tumor; or, in persons of advanced age, for cerebral hæmorrhage, embolism, or thrombosis. *Multiple cerebral* or *cerebro-spinal*, for functional paralysis agitans, the characteristic features of which will be again described; chorea; or tremor following hemiplegia from cerebral hæmorrhage or any other cause. *Spinal* for softening of the cord, from which sclerosis is distinguished by the preliminary symptoms of meningitis, peculiar gait in many cases, less complete paralysis, and slower progress. The distinctions between the varieties of sclerosis have been sufficiently indicated in their several descriptions.

PROGNOSIS.—In the great majority of cases this is very unfavorable, the disease tending to progress, but in some instances treatment seems to delay the disease, while symptoms may be ameliorated, and, it is said, even a cure may be brought about occasionally.

TREATMENT.—It is important in all varieties of sclerosis to maintain the general health by means of good diet, tonics, cod-liver oil, strychnine, and such remedies. Passive exercise in the open air may be of service. If any syphilitic taint is suspected, iodide of potassium and bichloride of mercury should have a fair trial. Hammond recommends, when sclerosis affects the brain, chloride of barium, gr. i, three times a day, and tincture of hyoscyamus, ʒi, ij, morning, noon, and night. In the spinal form, if there are signs of congestion in the early stage, he gives ergot; later on, nitrate of silver and cod-liver oil. Various baths have been employed, but are of questionable use. Electricity is often of much service. The primary current should be applied along the nerve-centres and to tremulous muscles, and the induced current to paralyzed parts. Symptoms must be attended to as they arise, and cleanliness strictly enjoined.

VI. PARALYSIS AGITANS—SHAKING PALSY.

It has been customary to describe paralysis agitans under the two forms of *senile* and *non-senile*. The cases classed under the *senile* variety, however, are merely those of multiple cerebral or cerebro-spinal sclerosis. It only remains here to allude briefly to the *non-senile* form. This is presumed to be a functional disorder, or at any rate no definite organic lesion has as yet been made out.

ETIOLOGY.—This complaint has been mainly attributed to violent emotion, long-continued anxiety or grief, continuous or severe exertion, injury, and exhausting diseases. Special varieties of paralysis agitans have been described as *hysterical*, which occurs in hysterical persons; *reflex*, due to some reflex irritation (worms, wounds, etc.); and *toxic*, resulting from the action of some poison upon the system (mercury, alcohol, tobacco, tea, or coffee). The persons affected may be of any age, and are usually under 50.

SYMPTOMS.—The chief symptom is tremor, either very limited or more or less extensive, and usually exhibiting little or no tendency to advance. It is independent of voluntary movements, but may be controlled by holding the affected part. Mental excitement, fatigue, and depressing influences increase the movement, which, except in extreme cases, ceases during sleep, and may present intermissions during the day. Diminution in muscular power is perceptible but not marked as a rule. Sensibility is not affected, and there are no head-symptoms or festination. The duration is indefinite, there is no fatal tendency, and in many cases, especially if the cause can be removed, a cure may be effected.

DIAGNOSIS.—Paralysis agitans might be mistaken for multiple cerebral or cerebro-spinal sclerosis, or for chorea. Attention to the etiology and symptoms alluded to above will enable the diagnosis to be made.

PROGNOSIS.—Death is a very rare event from paralysis agitans. It may prove a very difficult complaint to cure.

TREATMENT.—The indications are to remove the cause; give good diet; avoid fatigue and mental excitement; improve the general health and condition of the nervous system by strychnia, iron, phosphorus, arsenic, zinc, and similar remedies; administer sedatives, such as bromide of potassium, opium, conium, or cannabis indica; and apply the constant current along the affected muscles and over the spine. Bath and friction might also be of service.

VII. GLOSSO-LABIO-LARYNGEAL PARALYSIS.

ETIOLOGY.—The causation of this rare affection is very obscure, and in the majority of cases its origin cannot be made out. The disease has in some instances been attributed to syphilis, rheumatism, mental anxiety or worry, or excessive application to business. It seems to be most common in middle-aged adults.

ANATOMICAL CHARACTERS.—The lesions which have been discovered consist in atrophy and destruction of the nerve-cells forming the nuclei of origin of the hypoglossal, facial, spinal accessory and pneumogastric nerves, in the medulla oblongata and upper part of the spinal cord. Afterwards the disease affects the roots, and may extend along the trunks of the nerves. It may also pass down the cord more or less. The paralyzed muscles present a healthy aspect.

SYMPTOMS.—The chief clinical phenomena depend upon paralysis of the muscles of the tongue, palate, and pharynx, and of the orbicularis oris. In course of time the larynx and respiratory muscles become involved. In the great majority of cases the tongue is first affected which is indicated by some embarrassment of speech and impaired articulation. Especially difficult is it to raise the tip of this organ to the roof of the mouth, or to bring it against the upper teeth; hence

words beginning with lingual and dental consonants give most trouble. Then dysphagia is experienced, particularly as regards fluids, which are apt to pass into the larynx or through the posterior nares, causing much distress and danger. Consequently saliva accumulates in the mouth, assuming a viscid, glutinous, stringy character, and it flows out instead of being swallowed. Food collects between the gums and cheeks, because the tongue cannot remove it. When the orbicularis oris becomes involved, the lips remain apart and cannot be closed, so that the teeth are exposed, and the patient presents a peculiar and most unpleasant aspect. In time articulation and deglutition become impossible, the tongue remains at the bottom of the mouth as a sodden, inert mass, and the patient has to be fed. General debility results, in consequence of the interference with nutrition. Subsequently the implication of the respiratory muscles leads to difficulty of breathing, and inability to cough; while, when the larynx is affected, voice becomes absolutely lost. The mind is usually clear to the last, but the emotions are easily excited. If the disease extends down the cord, muscular atrophy or paralysis is observed in the corresponding muscles. This disease always proves fatal, death resulting either from gradual or sudden asphyxia; exhaustion; interference with the cardiac action; or from some intercurrent complaint.

DIAGNOSIS.—The conditions for which glosso-laryngeal paralysis might possibly be mistaken are simple paralysis of the tongue; facial paralysis, especially double; general paralysis of the insane; progressive muscular atrophy beginning in the tongue, lips, or palate; and diphtheritic paralysis.

PROGNOSIS is exceedingly grave, the termination being always fatal.

TREATMENT.—Galvanism might be tried, but is of little service. The patient should be fed on nutritious food, enemata or the stomach-pump being employed if necessary. No medicine has been found of any real use in this disease.

CHAPTER LXXXVI.

DISEASES OF THE SKIN.

A CONSIDERATION of the offices and functions of the skin is of great importance alike to the physiologist and the practitioner of medicine. As an external integument the skin affords a soft and flexible protection to the delicate vascular tissues beneath, and as the seat of the distribution of the peripheral terminations of many of the sensory nerves, it serves as an important and exquisite organ of the sense of touch. But it has other functions which are equally important to the animal

economy. By means of its sebaceous and sudoriparous glands the skin secretes and excretes a large amount of fatty matter, sweat, and nitrogenous products, and exhales a great quantity of water and some carbonic acid gas. In addition to these properties, it is also capable of some degree of absorption of fluids and drugs. The functions of the skin, therefore, correlate those of the kidneys, lungs, intestinal mucous membrane, and probably also some of those of the liver and other excretory organs. These facts have not been overlooked by physicians who not unfrequently make use of the skin to relieve by diaphoresis the action of the kidneys or lungs when either of these organs is acutely inflamed. But, on the other hand, dermatologists have, as a rule, been slow to return the compliment by making the kidneys, lungs, and intestines do the work of a disabled skin. The truth is that, hitherto, diseases of the skin have been looked upon as peculiar in their nature and altogether different from the morbid changes that occur in other tissues and to be treated therefore in some special way. The ordinary rules of practice have, in consequence, been too commonly neglected in the treatment of skin affections. It will be, however, one of the objects of this chapter to endeavor to show that really few pathological changes occur in the skin that may not—allowing for differences in situation and structure—be repeated in the other tissues and organs of the body.

If more care were taken to elicit all the facts in the histories of the cases brought before us, and more pains were bestowed upon the elucidation of the pathological relations of the various morbid phenomena that the skin presents, it would be found that a very large number of diseases of the skin are really directly or indirectly due to changes in the internal viscera or in the vascular or the nervous system. Many, we feel sure, are neurotic, but this is not the place to attempt to differentiate between idiopathic diseases of the skin and symptomatic diseases or diseases which are, as it were, merely the cutaneous reflection of internal changes. Let it suffice for our purpose that the term "skin disease" applies to every deviation from the normal condition of the structure and function of the skin and its appendages, the glands, hair and nails. In the following pages, however, only those diseases will be discussed, and that very briefly, that are likely to come under the notice of the medical practitioner and student in this country. Nor shall we consider those affections that have, by tradition and custom, been unreservedly given up to the charge of the surgeon. An account of these may be found in surgical works.

But in order to study diseases of the skin intelligibly and profitably, we must adopt some method of classification. The best method, perhaps, would be an anatomico-pathological one, the different diseases being divided into two great classes, namely, those having a constitutional origin, and those purely local, and peculiar to the skin itself, the morbid changes themselves being distinguished by the particular po-

tion of the cutaneous tissue they affect. Unfortunately, such a classification is, in the present state of our knowledge, impossible.

Many skin affections are clearly dependent on constitutional conditions, and many are purely local, but there is an intermediate class which is sometimes local, sometimes constitutional. For instance, some diseases which are local may be aggravated or determined by constitutional conditions, while many affections having their real origin in some morbid condition of the general system, are determined by some cause acting locally. On the other hand, a strict anatomico-pathological classification would be liable to become too complicated by the never-ending extensions and modifications of morbid action.

In this country, the system first proposed by Plenck, and subsequently adopted and elaborated by Willan, is the one most commonly accepted; but although it possesses certain practical advantages, it is open to the grave objection of including in the same order diseases which, beyond possessing one perhaps insignificant common character, are widely different.

The following plan, which resembles that adopted by Dr. Tilbury Fox, seems to possess the advantages of the Willanean system, on which, indeed, it is founded. It is, however, free from some of the faults of that system, and may be taken as that best adapted for the purposes of clinical study, and most likely to prove subservient to modern educational requirements.

Diseases of the skin may be classified as follows:

1. THE ERUPTIONS OF THE ACUTE SPECIFIC DISEASES.—These have already been fully described.

2. INFLAMMATIONS, comprising—*a.* The *Erythematous*, as erythema, roseola, and urticaria. *b.* *Catarrhal*, as eczema. *c.* *Bullous*, as herpes, pemphigus. (?) *d.* *Suppurative*, as ecthyma, impetigo, impetigo contagiosa, and furunculus. *e.* *Papular*, as lichen and prurigo. *f.* *Squamous*, as psoriasis, pityriasis simplex, and pityriasis rubra.

3. DIATHETIC AFFECTIONS, due to some constitutional change or disposition, as struma, syphilis, leprosy.

4. HYPERTROPHIES, as xeroderma, ichthyosis, corns, warts, and papillary tumors, keloid, molluscum fibrosum, elephantiasis arabum, etc.

5. ATROPHIES, as a general or local atrophy of the skin or its appendages, and senile decay.

6. NEW FORMATIONS.—Lupus, rodent ulcer, cancer, melanotic sarcoma.

7. HÆMORRHAGES, as purpura, which has already been described.

8. NEUROSES, as hyperæsthesia, anæsthesia, pruritus, angioneurosis.

9. PIGMENTARY CHANGES.—*a.* *Increased*, moles, melasma, chloasma, lentigines. *b.* *Diminished*, leucopathia, albinism.

10. PARASITIC DISEASES.—*a.* *Dermatozoic*, as scabies, phtheiriasis.

b. Dermatophytic, as *tinea favosa*, *tinea tonsurans*, *tinea kerion*, *tinea circinata*, *tinea sycosis*, *tinea versicolor*, *onychomycosis*, and, according to some, *tinea decalvans*.

11. DISEASES OF GLANDS AND APPENDAGES.—*a. Sweat glands*, miliaria, sudamina, lichen tropicus, dysidrosis, hyperidrosis, anidrosis, chromidrosis. *b. Sebaceous glands*, seborrhœa, comedo, acne, milium, molluscum contagiosum, xanthelasma, steatoma. *c. Hairs and their follicles*, sycosis, alopecia, calvities, fragilitas, polytrichia. *d. Nails*, atrophy, hypertrophy, and onychia.

ERYTHEMATOUS INFLAMMATIONS.

Under this heading will be described only the exudative erythemata, all of which are characterized by redness, due to hyperæmia of the capillaries of the papillary layer of the skin, and by the exudation of a certain amount of serous fluid into this layer and into the rete Malpighii. The exudation may in some instances be so small as to be entirely overlooked, and in others sufficient to cause swelling of the epidermic cells, as in the wheals of urticaria, or even to form vesicles or bullæ, as in the vesicular and bullous varieties of urticaria. The redness readily disappears on pressure, but returns immediately the pressure is removed. When the congestion subsides there is generally more or less of furfuraceous desquamation of the cuticle detached by the exudation. The exciting causes are local and constitutional. In the former the hyperæmia and exudation are almost the only phenomena present; but in the latter some febrile reaction, which is sometimes very severe, usually precedes the appearance of the redness. The duration varies from a few hours to several days.

Erythema is a diffuse or circumscribed inflammation of the superficial parts of the skin characterized by the presence of slightly elevated, red patches of various sizes, the color of which shades off towards the edge. The redness disappears under pressure, leaving a yellowish stain, due to the presence of serum in the lower layer of the cuticle, but at once returns when the pressure is removed. There is generally heat, tingling, and itching, and sometimes severe pain, together with a certain amount of constitutional disturbance, but the actual course varies according as the disease is of local or constitutional origin. When the redness is due to friction of two folds of skin, or to the irritation produced between them by retained secretion, it is called *erythema intertrigo*. The redness that is sometimes seen on the hot, tense, fissured skin of œdematous legs, and which occasionally leads to superficial ulceration, is named *erythema læve*; and the redness of an unbroken chilblain has received the dignified appellation *erythema pernio*.

But more important than these are the constitutional varieties. In *erythema papulatum seu tuberculatum* there are papular red patches and

tumefactions scattered about the body, but more particularly on the dorsal aspects of the hands, arms, feet, and legs, generally attended with a disagreeable burning sensation, and a certain degree of fever. In a few days the redness disappears, leaving papules covered with fine scales of desquamating epidermis. In a short time, the disease passes off entirely, no secondary changes, as pigmentation or thickening, so frequently seen in prurigo, remaining. In some rare instances the disease becomes chronic. The disease is most common in the spring and autumn, and chiefly occurs in children and young adults. Several minor varieties have been named after the accidental shapes that the patches sometimes assume, as *erythema iris*, *circinatum*, *gyratum*; while the term *erythema fugax* is given to the transient red patches that sometimes show themselves on the neck and face after errors of diet, etc. The most important variety, however, is that called *erythema nodosum*, which consists of well-defined oval or circular, slightly elevated, red patches, from a quarter of an inch to an inch and a half in diameter, which usually occur on the front of the legs parallel to the tibia, the swelling and redness gradually shading off into the surrounding tissues. In a day or two the swellings, which were at first pale and then yellow, assume a purplish tinge, and soften in the centre, but never suppurate, and finally disappear with desquamation of the cuticle. The disease is, however, liable to recur, especially if the health remain impaired. Sometimes the patches which are due to a serous exudation in the deeper layers of the skin, show themselves on the upper limbs, and also on the face. The disease is met with for the most part in children, especially girls, and in delicate adults, and is generally preceded by some febrile disturbance, and has been observed to be frequently associated with acute rheumatism.

Roseola is a non-contagious, febrile disease, accompanied by the eruption on the skin of minute, rose-colored, non-crescentic spots, which are generally attended with considerable itching and tingling. There is not necessarily any catarrh, and the eruption is very irregular in its situation and extent. The disease is frequently seen in infants, hence the term *roseola infantilis*, and the variety which occurs from exposure to the sun in summer is called *roseola æstiva*. The redness, which is usually preceded by some constitutional disturbance, lasts from a few hours to several days. A roseolous rash sometimes precedes the outbreak of the variolous eruption or an attack of typhus fever, and sometimes it makes its appearance four or five days after vaccination. It is often seen also in gouty or rheumatic persons, and may occur in cholera. All these varieties have been honored with special names. Certain medicines, as belladonna and copaiba, may produce a roseolous rash on the body, which rapidly disappears on the discontinuance of the drug.

Urticaria is due to the rapid serous infiltration of the cells of the lower layer of the epidermis, which results in the formation of slightly

elevated, pale patches of various shapes and sizes known as "wheals." That this is the true cause of the wheal may be proved by puncturing the swelling and letting out the transparent clear serum. The operation, however, requires to be done with very great care, for, if the point of the needle pass beyond the rete Malpighii the vascular papillæ may be readily made to bleed. This explanation is, moreover, confirmed by the fact that the exudation is sometimes sufficient to raise the cuticle and produce a vesicle or even a bulla, as in *urticaria vesiculosa vel bullosa*. The disease may be acute or chronic, and due to local or constitutional causes, or to the presence of certain poisons in the blood. There are, therefore, many distinct varieties of urticaria, all of which may, perhaps, be ultimately traced to the same cause, namely, irritation. The irritation is not, of course, always the same. Sometimes it arises from something applied to the skin and sometimes to something within. There are, therefore, *urticaria from external irritants*, as the bites of insects and the stings of nettles, and *urticaria from irritants that have gained admission into the body by the food*, *urticaria ab ingestis*, as shell-fish, certain kinds of fruits, and some drugs, as belladonna and copaiba. Urticaria is common in gouty persons especially if the skin be irritated, and it may occur in any one whose system is surcharged with waste products. It is also liable to appear in women who suffer from amenorrhœa or other uterine disturbance (*urticaria uterina*), and may occur from gastro-intestinal disturbance of any kind. In such instances the skin lesion is distinctly neurotic and reflected. When pyrexia accompanies the formation of wheals the disease is called *urticaria febrilis*. If the disease recurs again and again or continues for a long time, it is termed *urticaria chronica*. There is, lastly, another variety, which is seen in children, in whom from gastro-intestinal disturbance, or from mere local irritation, an obstinate urticaria is developed which leaves behind a crop of papules due to the engorgement of the papillæ and follicles of the skin. This has been called *urticaria papulosa*, or *lichen urticatus*.

There is always a considerable amount of itching and tingling, which may last a few minutes or for many days. The constitutional symptoms are not usually severe, but sometimes there is high fever, vomiting, dry tongue, and even delirium. The wheals are, as a rule, very transient and do not usually last more than an hour or two, but sometimes they last many hours, and even days. The paleness of wheals is owing to the pressure which the exuded serum exerts on the papillæ.

TREATMENT.—It will be seen that constitutional and local remedies will be necessary in the majority of the cases, but in all the cause must be removed. Locally, soothing applications are best, as the various preparations of zinc, calamine, lead, etc. Excoriated surfaces must be protected, and where the surface is chafed by the friction of two folds of skin, the parts must be kept dry and separated by folds of lint.

which some absorbent and soothing powder has been sprinkled. All local and internal irritants must be removed. An occasional mild purge and light diet for a day or two is all that will be necessary in most cases. Whenever the disease is due to poisonous food the stomach should be at once emptied by emetics. In erythema nodosum, however, quinine alone or combined with some preparation of iron will be found very useful in preventing the recurrences.

CATARRHAL INFLAMMATIONS.

Much contention and not a little confusion have arisen out of the attempts to define what is really meant by catarrhal inflammation of the skin. According to some writers the inflammation is not catarrhal unless there be a visible serous exudation into the upper layers of the skin and on its surface. Anything short of this or beyond it is not, in their opinion, catarrhal. Such limitations appear not only unnecessary but illogical. There are some cases of inflammation of the skin in which there is just sufficient exudation to cause furfuraceous desquamation of the epidermis, while in others the exudation pours out in enormous quantities so as to saturate the clothing and dressings of the patient. In other instances again the inflammatory processes may go on to actual suppuration with the formation of large thick crusts. The definition of eczema, therefore, should be sufficiently wide to embrace all the inflammations of the skin that present the characters hereafter to be described. The plan is sometimes followed. When the serous exudation is very scanty the disease is termed *eczema siccum*. When more copious, so as to give rise to weeping of the diseased surface, *eczema humidum vel serosum*, and where there is free formation of pus, *eczema pustulosum v. suppuratorium*. We should, if we wish to comprehend all the phenomena of eczema, banish from our minds the narrow notion that eczema is always a vesicular disease. The vesicles in eczema are, as it were, mere accidents, in the sense that they depend on the nature of the inflammation, on the quantity of serous exudation, the situation of the disease, the character of the epidermis in the affected parts, and to some extent on the exciting cause, and on the constitutional condition of the patient. It is true that vesicles are among the most common manifestations of the early stages of eczema, but they are no more essential than the so-called papules or pustules. In some cases the inflammatory effusion is so great that the neighboring tissue becomes œdematous, especially when there is much loose connective tissue. (Edema of the eyelids and swelling of the face is, indeed, often one of the earliest indications of acute eczema of the face.

Eczema may therefore be defined as an inflammation of the skin, with cell-proliferation and exudation into the papillary layer of the cutis and into the rete Malpighii, giving rise to thickening and infiltration of

the skin and the formation of papules, or closely packed vesicles, or pustules which soon run together, burst, and expose an excoriated, reddened surface discharging a fluid which dries into yellowish or brownish crusts. Sometimes for days or even weeks before eczema breaks out the skin itches, is dry, harsh, and red, and covered with fine brown scales, or the patient scratches and rubs the part and determines the outbreak of an acute attack of eczema. Before the discharging stage is reached there is generally considerable pain, heat, redness, and swelling, in fact all the classical symptoms of inflammation. Fresh crops of vesicles come out from time to time, but sooner or later the discharge diminishes in quantity, the redness gradually fades, and the swelling subsides, leaving a dry reddish patch covered with thin scales, which may speedily disappear or remain for many weeks or even for months.

It must not be imagined that because it has been stated that a papule may be the initial lesion of eczema, by that term is meant exactly the same thing as a lichenous papule. Lichen is quite distinct and separate from what is ordinarily regarded as eczema in almost every respect, in the nature of the lesion, its seat, its course, and its termination. All that it is intended to imply by the papular stage of eczema is the effusion of a quantity of serum just sufficient to form a papule, but not enough to produce a vesicle.

The causes of eczema are constitutional and local, among the former of which may be mentioned dyspepsia, sluggish action of the liver or kidneys, and gout. Anything that irritates the skin locally may produce eczema; the disease is also very apt to occur on the congested skin of legs in which the veins are enlarged and varicose.

In the simplest form it is called *eczema simplex*, but when there is much inflammation and great redness, with heat, swelling, and perhaps also pyrexia, it has been named *eczema rubrum*. Other varieties have been designated according to the seat of the disease, whether on the scalp, ear, face, hands, nipple, etc.; but the disease is pathologically the same in every case. It may, however, be remarked that when there is much pus formation, or when the disease commences with pustules, it has received the special name of *eczema impetiginodes* or *impetigo*. When the patches are dry and covered with thick hard scales, the disease is called *eczema squamosum*. The term *eczema marginatum* has been given by Hebra to a variety which commences on the inner part of the thigh against which the scrotum lies, by a small and circular excoriated patch which spreads upwards to the abdomen and backwards to the buttocks, but leaves the penis untouched. Eventually, the disease may reach the upper part of the chest by extending at the periphery at the same time that the centre clears. It is most commonly seen among shoemakers and horse-soldiers. By some it is regarded as being syphilitic, and by others as parasitic, due to the tricho-

phyton tonsurans, the latter view being correct for the majority of cases. There is, lastly, a variety of chronic eczema which is more frequent than is commonly imagined. The disease is characterized by circular patches, especially on the back of the hand and on the forearm. There is not much discharge and only little crusting, but the itching is often intense. On examining microscopically the crusts of several of these cases I have often found some of the trichophyton fungus, and it would seem that these cases are really inflamed patches of tinea circinata. Certain it is, they readily recover under parasiticide treatment. This variety may, therefore, be *eczema parasiticum*.

When eczema has lasted some time, the skin becomes thickened, infiltrated, and fissured (*eczema rimosum*). The papillæ become enlarged and infiltrated with cells, and there is also increased pigmentation and staining.

There is a very obstinate form of eczema that occurs on pale, ill-developed, ill-nourished xerodermatous skins. This variety which may sometimes last a lifetime is most common on the extremities, especially in the flexures, and is often attended with some superficial ulceration. It gets better and worse from time to time, but is always aggravated by a stormy damp state of the atmosphere, or by any deterioration in the patient's health. Although much may be done by protecting the skin to alleviate the pain and discomfort, the disease itself is often incurable notwithstanding all the ordinary forms of treatment.

TREATMENT.—The treatment of eczema must necessarily vary so much in all cases, that it would be useless in these pages to attempt to do more than to give a few general hints. Every case must be treated on its merits. It may be laid down as a general rule that in the acute stages the skin should be protected and soothed; later on astringents may be used, and when the redness and discharge have subsided, mild stimulants and absorbents should be carefully employed. The various functions of the body must be attended to, and the free action of the kidneys, liver, and intestines insured. In the acute stages great benefit will be derived from the administration of alkaline diuretics with occasional small doses of colchicum. All stimulants, such as alcohol, coffee, savory dishes, and seasoned food should be strictly prohibited as long as there is much inflammation. In weak debilitated persons cod-liver oil and quinine and iron will prove of great service. Arsenic sometimes answers well in chronic cases, especially where there is much thickening and scaliness, but in the acute stages this drug should not be employed.

Locally, the treatment should vary with the stage of the disease and the condition of the tissues. When there is great inflammation and copious discharge, warm or cold water dressings are best, and the diseased surface should be kept clean and free from crusts. If the discharge be hot and irritating, an alkaline lotion containing bicarbonate

of soda and borax will afford great relief. An oxide of zinc lotion with prepared calamine or a weak lead lotion will not unfrequently alleviate the pain, check the discharge, and expedite the cure. If the disease extend over a wide area, the application of carron oil or equal parts of almond oil and lime-water will both soothe and protect the surface. When the disease has become subacute, the writer has found a lotion containing two or three grains of chloral hydrate to an ounce of camphor-water, a most valuable application. The rapidity of the cure in some cases even of long standing has often been quite surprising. It must be observed, however, that the first few applications of the chloral hydrate lotion sometimes cause smarting, which lasts for half an hour or so, but no inconvenience is complained of after the lotion has been used a few times.

The thickening and infiltration that are so often seen in chronic cases of eczema may generally be removed by the use of a lotion containing one drachm of liquor potassæ to two ounces of water, or by the cautious application of soft soap. Weak preparations of tar will often serve to cure a case that has long resisted all other modes of treatment. An ointment containing five grains of ammoniated mercury and ten grains of precipitated sulphur to an ounce of lead, is very useful in eczema of scalp, face, and hands.

Eczema marginatum must be attacked by parasiticides. For this purpose the strong ammoniated mercury ointment is useful, but better and cleaner than this is a lotion containing two grains perchloride of mercury in half an ounce of dilute acetic acid and half an ounce of water. Glycerin and borax or a carbolic acid lotion or ointment from 1 to 19 to 1 to 20, or a hyposulphite of soda lotion will answer equally well. I have frequently found the daily employment of the continuous electric current very valuable in that form of chronic eczema, which occurs in xerodermatous states of skin. By this means I have succeeded in curing in the course of a few weeks cases that had resisted all other modes of treatment for years. The *modus operandi* of this therapeutic measure seems to be according to the well-known action of the continuous current on the nutrition of tissues.

BULLOUS INFLAMMATIONS.

Many authorities include under this heading rupia, ordinary herpes, and pemphigus. But as rupia is always syphilitic, it will be described with the syphilitic diseases of the skin. It would, perhaps, be more correct to regard the bullous diseases as neurotic, but as our information is not yet quite complete, we shall adhere for the present to the more popular clinical classification. It may, however, be remarked that herpetic eruptions always bear some anatomical relation to the distribution of the cutaneous nerves, and in this fact we may look for some

elucidation of its pathology. Overwhelming evidence has of late years been adduced to prove that herpes is really due to some change in the nerves. Bärensprung has found in a case of herpes zoster an irritative overgrowth of cells within the neurilemma of the spinal nerves and their ganglia. Charcot has furnished similar evidence, which has been further confirmed by a case recently recorded, in which there was an outbreak of frontal herpes when the Gasserian ganglion was involved in a cancerous mass, that had spread from the face.

A bulla or herpetic vesicle is produced by the superficial inflammation of the skin and the rapid exudation of a large quantity of serum into the papillary layer and into the rete Malpighii, causing the formation of a bladder or bleb. The course varies, and may be acute or chronic, and the disease is very apt to recur.

Herpes may be defined as an acute, non-contagious disease which runs a definite course, and in which groups of vesicles appear on a reddened portion of the skin. These groups which vary much in size do not come out simultaneously, but follow one another at irregular intervals. The outbreak of an herpetic eruption upon the lips and on the mucous membrane of the hard and soft palates of patients suffering from certain febrile affections, but especially pneumonia and cerebro-spinal meningitis, is generally regarded as a favorable prognostic sign. Herpes may, however, appear on persons previously apparently quite healthy.

The disease is liable to occur at all ages and in both sexes, but it is most common between the ages of twelve and fourteen. It is said not to occur in babies, but I have seen a well-marked case at University College Hospital in an infant two months old.

Several varieties have been named according to their seat, as *herpes frontalis*, *facialis*, *labialis*, *preputialis*, while the term *herpes zoster* or *zona*, or shingles, is given to the variety which occurs on the trunk. But all these forms are, no doubt, essentially identical.

The disease usually commences with a pricking, burning pain, which is sometimes severe and is frequently preceded by fever. In a few hours red points appear on the skin along the course of a particular nerve, and within twenty-four hours a group of clear watery vesicles or small bullæ is seen on the reddened base. The pain now usually subsides, but it may last for days or weeks, or may return long after the eruption has disappeared. The contents of the vesicles soon become turbid, and in a few days dry up into brownish scabs, which fall off in about ten days, leaving little cicatrices which may or may not remain. The eruption is generally entirely confined to one nerve, and rarely extends far beyond the mesial line of the body, and still more rarely is it found symmetrical or on both sides of the body. Occasionally, distressing constitutional symptoms precede the appearance of the vesicles, and in some of the cases where the eruption has appeared on the face, the severity of the

preceding symptoms had led to the diagnosis of serious affection within the cranium. But all these symptoms usually subside on the appearance of the vesicles. In some cases where the eruption has followed the course of the ophthalmic division of the fifth, serious and even destructive inflammation of the eyeball has been observed, especially when the nasal branch of the nerve has also been affected.

It frequently happens, especially in the form that occurs on the prepuce or on the dorsum of the penis, that the disease recurs with a degree of periodicity, the intervals varying from a month to a year or more. It has been stated that herpes on the external genitals is always the result of venereal disease, but this is not true. Many chaste persons, both male and female, are affected with a troublesome form of herpes in these parts. It has occurred to me to meet with two cases in which syphilis was contracted while the patients were suffering from herpes of the penis, and for years afterwards the herpes returned at intervals apparently quite uninfluenced by the syphilitic taint.

The affection commonly known as *herpes circinatus* is probably always of parasitic origin, and is not, therefore, an herpetic eruption in the sense in which we have been speaking.

TREATMENT.—As the disease is self-limited, the duty of the practitioner is simple. He cannot hope to hasten or retard its progress. If the parts be protected by cotton-wool and some cooling powder, as starch and oxide of zinc, all that is necessary will have been accomplished. Subsequently, quinine combined with small doses of iodide of potassium may be found of great benefit, and should the pain recur or never entirely subside, the application of a belladonna plaster or inunction with belladonna ointment will be found useful.

Pemphigus.—In this disease there are large isolated bullæ, filled with clear fluid upon a slightly reddened but not hardened base. The lesion, in fact, resembles an ordinary blister. The cause is very obscure. It occurs on the palms and soles of newly-born children as the result of syphilis, and is then nearly always fatal. It is more common in children than adults, although I have seen a well-marked case in an old man over sixty years of age. Generally, the eruption is preceded by ill-health and cachexia, but sometimes the patient is apparently in good health.

The disease commences as a red discoloration, which itches and burns. Upon this a bulla forms, which may from the first acquire its full size, or commence as a small vesicle which rapidly increases in size. At first the bulla is tense, round, or oval, with clear contents, and varies in size from a pea to a hen's egg. In a day or two the contents, as well as the cuticle, become opaque. In cachectic persons the contents are often mixed with blood. In two or three days the bleb bursts, and leaves a moist discharging excoriation, which soon becomes covered with a scab, under which new epidermis forms. For a long time after-

wards a pigment stain, but not a cicatrix, marks the site of the old bulla. Before one set of bullæ has disappeared fresh crops spring up, which are themselves succeeded by others, and so the disease is prolonged for weeks or even months. The *acute* form is most common in children and usually lasts from a month to six weeks, but the *chronic* form may occur at all ages, and may last for many months. Sometimes only one bulla is present at a time, as in *pemphigus solitarius*. The extremities are the most common seats of the eruption, but it may occur on any part of the trunk.

If the disease be unchecked, the patient loses health and strength, and may ultimately die of marasmus.

In the variety of the disease known as *pemphigus foliaceus*, the disease begins as a solitary bulla, or by several small bullæ which unite and spread, until in the course of months they have increased to such an extent that the entire skin looks flayed. The bullæ of the foliaceous variety differ from those of ordinary pemphigus, inasmuch as they are flaccid and their contents are, from the first, turbid. In the advanced stage of the disease the surface of the body is covered with thick dirty-looking crusts, which consist of dried serum, abortive epidermis, and sebaceous matter. If the crusts are removed a raw, angry-looking surface is exposed upon which new cuticle does not form. Sometimes the disease is rapidly fatal. During the past year there have been two typical cases, both in women, of pemphigus foliaceus in University College Hospital. One of the patients, a woman about thirty years of age, died within a few weeks of admission. The other case was that of an old woman who left the hospital after about four months' sojourn, unrelieved. The disease is, however, rare in England and is commonly fatal.

If the characters of the disease as just described be borne in mind, there will be little difficulty in distinguishing herpes and pemphigus. It may, however, be observed that whereas herpes, at least herpes zoster, does not, as a rule, occur more than once, pemphigus usually recurs many times.

TREATMENT.—The treatment of pemphigus resolves itself into giving tonics and good food. Locally, but little can be done beyond protecting the skin by unctuous applications; it has been recommended to puncture the bullæ and pencil the subjacent tender cutis with a solution of nitrate of silver, ten grains to the ounce, which hardens the surface and destroys the great sensibility of the exposed skin.

PUSTULAR INFLAMMATIONS.

By this is meant diseases in which the inflammation proceeds to visible pus formation as a primary phenomenon. We have already seen that in eczema the exuded fluid may produce a vesicle which may burst,

or which may become purulent by the accumulation of pus-cells within it. And, accepting the modern views of pyogeny, there is little difficulty in understanding that all the so called catarrhal inflammations may become suppurative; that, in fact, all inflammations are attended with a certain degree of pus formation. Although, therefore, impetigo, and impetigo-contagiosa, ecthyma and furunculus have been classed as suppurative diseases, only the two latter can strictly be so called, for the first is merely a phase of eczema, and the second is really a vesicular disease, which may be accompanied by slight suppuration.

One of the affections most commonly known as impetigo is an inflammation of the hair and the sebaceous follicles, and should be so described, whereas the disease generally called impetigo is really the impetigo contagiosa of Dr. Tilbury Fox, which we shall now describe.

Impetigo Contagiosa.—If some of the clear fluid from one of the vesicles of this disease be inoculated into a healthy subject, the point of inoculation remains red, and in twenty-four or thirty-six hours a minute vesicle forms preceded and accompanied by severe and almost intolerable itching. If the cuticle be not ruptured the vesicle increases in size and the contents become sero-purulent, and in two or three days dry up into a flat, straw-colored scab, under which new epidermis forms and the disease rapidly passes off. But as seen in patients the eruption is somewhat different, for it is often preceded by a little constitutional disturbance, and the vesicles which generally appear first on the face may extend to the trunk, but usually remain isolated. The fingers may become inoculated by scratching, and in turn convey the poison to other parts of the body. Sometimes the disease appears to be epidemic, and affects the whole body like one of the acute specific diseases, with the exception that it usually takes a week or more for the body to become so extensively involved. It is most commonly met with in children, but not unfrequently it affects adults. The nature of the poison is unknown, although some observers have supposed it to be a minute fungus which they have discovered in the scabs, but it is difficult to imagine that the fungus, which is met with in the crusts and which cannot be found in the clear fluid when it is most inoculative, should be the agent of contagion.

TREATMENT.—The scabs should be removed by poultices or by oil, the hair being cut short if necessary, and an ointment composed of ten grains of ammoniated mercury to an ounce of lard applied to the raw surfaces. This will serve to cure the disease in a few days.

Ecthyma.—In this disease the pustules are seated on an elevated, reddened, and indurated base. The suppuration rarely affects the tissue of the true skin, but is confined to its surface. If the true skin be affected and ulceration take place a cicatrix will result, but usually only a red mark remains, which in time clears off.

An ecthymatous eruption may be produced by the local application

of tartar emetic ointment. The disease may also be produced by anything that irritates the skin, especially in cachectic subjects, and it is a common complication of scabies in children. It is sometimes met with during the course of febrile diseases, and may occur without any apparent cause in ill-nourished and debilitated persons.

The inflammation which precedes the formation of the pustule is sometimes attended by constitutional disturbance, and fever, and a good deal of shooting pain. The pustules themselves are isolated and surrounded by a broad, red areola, and are seen most commonly on the extremities and buttocks, but sometimes on the trunk. The pustules are large, about the size of a split pea, or even much larger, and their contents often become mixed with blood. The contents soon dry up into brownish scabs which fall off in from ten to fourteen days, leaving behind red spots covered with new epidermis. Sometimes, however, suppuration continues beneath the crust, and as a result of the ulceration which takes place in the upper layer of the cutis, a permanent cicatrix results. There are two chief varieties, the acute and chronic. The former is generally accompanied by severe constitutional symptoms.

TREATMENT.—Remove local causes, as scabies, etc.; apply astringents, as subacetate of lead ointment, zinc, or lead lotion; and give tonics and good food.

THE PAPULAR INFLAMMATIONS.

In the diseases included under this heading the inflammation is accompanied by serous exudation into the papillæ and rete with more or less cell-proliferation and increased formation of the epidermis, which give rise to the formation of papules and thickening of the skin. The diseases comprised in this class are *lichen* and *prurigo*. These diseases are for the most part constitutional in their origin, and require general treatment. They are usually chronic and are very apt to recur.

Lichen.—In this disease there is an inflammation of the skin, in which the exudation and the new tissue form little solid elevations called *papules*. There is also some exudation into the rete Malpighii of the epidermis, which causes fine desquamation when the disease resolves. The exciting causes are very obscure. The disease is frequently seen in strumous persons, but generally the subjects are tolerably healthy.

Lichen simplex is characterized by little papules of a pale-red color, which do not disappear, but become paler on pressure. The skin generally feels dry and thickened. There is usually some itching and tingling, but sometimes there is no annoyance whatever. The most common seats are the back of the hands and forearm, the neck, and the thigh. The papules disappear in a week or two, and the disease ter-

minates by desquamation of the cuticle. Sometimes, however, the disease becomes chronic, and may last for weeks or months. The disease may occur in circular patches, which fade in the centre as fresh papules form at the margin, giving rise to the appearance known as *lichen circumscriptus*, and when several of these patches unite *lichen gyratus* results. *Lichen lividus* is really purpura, and *lichen urticatus* has already been described as a papular form of urticaria. In *lichen agri* the appearance of the papules is accompanied by severe inflammation and almost intolerable itching and burning. The patches are scratched and excoriated, and pour out a serous exudation, by which the disease is made to resemble eczema. In *lichen pilaris* the papule is situated at a hair-follicle, and the disease is characterized by the passage of hair through the centre of the papule, which consists of dried serous exudation and epidermic accumulation.

Hebra has described a variety of lichen, which he has designated *lichen exudativus ruber*, and which seems to be an aggravated form of the *lichen planus* of Mr. Erasmus Wilson. In this disease there is enlargement of the root-sheath at the lower part of the hair-follicle which becomes expanded into little finger-like projections. The upper part of the sheath is also greatly hypertrophied, and presents an infundibular appearance with the base upwards. The disease shows itself externally as small, isolated, pale-red papules with flat tops, covered with fine silvery scales. Larger or smaller patches are formed by the development of fresh intermediary papules, and not by a peripheral extension of the old ones. The disease spreads till it affects a whole region or even the entire body. The appearance is then quite characteristic. The integument is harsh, dry, thickened, reddened, and covered with fine, silvery, epidermic scales, which differ, however, from those of psoriasis. The affection is very chronic and apt to recur. For many weeks or even months after the subsidence of the papules and thickening, deeply pigmented atrophied depressions may be seen on the skin. The staining is often more marked and more persistent than that of syphilitic eruptions. The most common seats of the disease are the upper limbs, especially the flexor aspects of the wrist and forearm, and the front of the legs. The patients are, as a rule, pale and out of health, and not unfrequently suffering from the effects of overwork and worry. It is stated that sometimes the disease terminates fatally.

Lichen scrofulosorum is the name given by Hebra to a disease that is rare in this country. The affection, which is most frequent in children, is characterized by the appearance of small papules of a dark-red color occurring in crescentic or circular groups. The papules are situated at the mouths of the hair-follicles and are covered with epidermic scales which may be readily removed. The disease may show itself on any part of the body, but is most common on the back, abdomen, and chest.

and more rarely on the extremities, and is often associated with pustules and the ordinary manifestations of a strumous habit of the body. Although the papules frequently disappear of themselves, they are liable to recur again and again. Cicatrices generally mark the seat of the papules.

TREATMENT.—In the acute stages soothing applications such as gentle frictions or packings with oil must be used, and the general health must be treated according to the indications present in any individual case. Should the disease become chronic some stimulating applications will be necessary, as carbolic acid, tar, or some of the mercurial preparations. Internally, tonics or alteratives combined with some preparation of arsenic must be given for a long time.

Cod-liver oil will be necessary in the scrofulous forms.

Prurigo.—The papules met with in this disease are produced by serous exudation and cell-proliferation into and within the papillæ, and the rete Malpighii, for if the papule be punctured a drop of clear fluid escapes, or if it be squeezed the epidermis becomes tense and transparent, and a watery liquid appears. The whole of the epidermic layer is, moreover, greatly hypertrophied. The cause is not known, but the disease is rare in childhood, and is more common in men than women. The disease called *prurigo senilis*, which is really only the congestion of the papillæ and follicles of the skin produced by the irritation of scratching or of pediculi, etc., is not a true prurigo, and will, therefore, be considered when we speak of phtheiriasis. On the other hand, it must not be forgotten that the presence of any local irritant will aggravate true prurigo.

The disease is characterized by the presence of slightly elevated, broad papules, which are of the color of the skin. Many of the papules cannot be seen, but may be readily felt by passing the finger over the skin. There is always intense itching, which is made worse by anything which irritates the skin. By scratching to allay the itching the tops of the papules are torn off and become covered with little blood crusts. When the affection has lasted a long time, the skin becomes thickened, darkly pigmented, and perhaps studded with large pustules. Sometimes there is a sensation of formication, hence the name *prurigo formicans*. When the disease is mild it is called *prurigo mitis*, and when severe *prurigo ferox*, which is said by some to be incurable. It is rarely curable in adults, but in children the prognosis is more hopeful.

The most common seats are the shoulders, neck, and the outer aspects of the arms and legs and the buttocks.

TREATMENT.—Anything that is likely to aggravate the symptoms should be avoided, and soothing applications, anodynes, and sedatives should be applied. The itching may often be allayed by an alkaline lotion containing hydrocyanic acid, or in some cases by a solution of carbolic acid (1 to 20 or 1 to 40). Applications of mild preparations

of tar are often of service, and great benefit may often be derived from the use of a lotion containing about one-tenth to one-third of a grain perchloride of mercury to an ounce. The effect will, however, be greater if some bismuth and oxide of zinc powder be combined with the mercury. Some practitioners recommend the application of sulphur with or without tar; others prefer soft soap.

Tonics, cod-liver oil, quinine, and iron will be required in the later stages. A few cases, moreover, will be benefited by a course of arsenic.

SQUAMOUS INFLAMMATIONS.

In the diseases which belong to this class the inflammation is accompanied by increased formation of epidermis. Although we include under this head pityriasis rubra and psoriasis, the two diseases are very different. In the former there is a desquamation of the infiltrated cuticle from the whole body, and in the latter a *hyperplasia of epidermis* in certain regions as a result of the increased vascularity of the hypertrophied papillary layer of the skin. The former, moreover, is a general disease accompanied by constitutional symptoms, and may eventually terminate fatally, whereas the latter is rarely attended with any symptoms referable to the general system. Both are, however, liable to recur.

Psoriasis.—The epidermic formation is considerably increased as a result of enlargement of the papillæ and their capillaries. The papillæ are themselves the seat of cell proliferation and infiltration. The collections of epidermis vary much in size, from a minute point to extensive areas occupying many inches of surface. The favorite seats are the elbows and knees, from which the disease gradually spreads, keeping for the most part on the extensor aspect of the limbs. Next in frequency are the scalp, face and trunk, and more rarely the nails. The disease is often hereditary, but may occur in healthy persons, especially if they have become temporarily debilitated.

It would almost appear that in some instances psoriasis is strictly and literally a disease of the skin, due solely and entirely to some perverted state of the nutrition of certain areas of the cutaneous tissue and altogether independent of the general system. This is more particularly the case in some of the hereditary forms—the disease continuing for years uninfluenced by any condition of health or by treatment. But this is not always the case, for psoriasis is very prone to be transmitted in scrofulous and gouty families, and in these instances the state of health does affect very materially the skin affection. In gouty subjects, for instance, outbreaks of psoriasis may alternate with ordinary attacks of gout, and sometimes the skin disease may be made to disappear by remedies that relieve or remove the other gouty symptom. Particular kinds of diet seem to start the disease in some persons,

all events the disease may sometimes be cured by changes in the diet. Dr. Passavant of Frankfort, and the late Dr. Parkes of Netley, whose valuable and intelligent labors have done so much to advance the art and science of medicine, have each observed chronic psoriasis to rapidly disappear when the patient was placed on a meat diet, although every other mode of treatment had previously failed.

Psoriasis is characterized by the appearance of dusky red or coppery, slightly elevated patches, covered with white silvery scales. At first the spots are minute, as in *psoriasis punctata*, they then increase in size, and the disease is called *psoriasis guttata*; when they are still larger, *p. nummularis*, when very extensive, *p. diffusa*, and when they consist of rings, *psoriasis circinata* or *lepra*, which is merely an advanced, or, may be, healing stage of psoriasis, and from which it does not essentially differ. When adjoining rings coalesce, they cease to extend in that direction, and from the odd figures sometimes thus produced, the disease has been called *psoriasis gyrata*.

Another variety of which I have seen many examples has been termed by Dr. McCall Anderson *psoriasis rupioides*. In this form, which occurs most frequently on the chest, the scales are collected into rupioid crusts. The disease is not essentially syphilitic, although it may occur in syphilitic or strumous persons. If the crust be torn off and the lower layers examined under the microscope, they will be found to be crowded with leucocytes and abortive epidermic cells. The base from which the crust is detached is often raw and very vascular.

When psoriasis has lasted a long time, the structure of the skin becomes altered, the elements of the true skin being replaced by fibroid tissue, so that the integument is thickened and indurated, harsh, dry and fissured.

TREATMENT.—In the acute and congestive stages soothing applications, such as water-dressing, oil, or alkaline baths are best. Later on, when only thickening and scaliness remain, some preparation of tar will be found useful. As regards the general treatment, the kidneys and liver should be made to act freely, and when the congestive stage has passed, tonics may be prescribed. Cod-liver oil should of course be given to strumous patients, and an occasional course of alkaline colchicum mixture may often expedite the cure in gouty subjects. In chronic cases, especially where there is an excessive formation of epidermis and thickening of the skin generally, some preparation of arsenic should be given. If the subjects be anæmic, steel wine and the arsenical solution answer well, but if there be no anæmia, the arseniate of soda combined with gentian and bicarbonate of soda, may be found to answer better, especially if there be a tendency to chronic gastric catarrh. But it must be borne in mind that whenever arsenic is given, it should be continued for a long time in gradually increasing doses. The fact that the arsenic produces irritation of the mucous membrane is not of itself an

indication to discontinue the remedy. To insure a cure, the drug must be continued for at least six weeks after all traces of the disease have disappeared.

Pityriasis simplex consists of a slight superficial inflammation of the skin, followed by a furfuraceous desquamation, and is generally of an eczematous nature. The scalp is the most common seat. This is altogether different from the disease which Hebra has described as *pityriasis rubra*, which, although not common in England, is sufficiently frequent and important to merit some consideration here.

TREATMENT.—Oily and astringent applications cure the simple form.

Pityriasis rubra of Hebra is an acute general superficial inflammation of the skin which may begin in any part, but *which extends over the whole body within a few weeks*. The cutis is intensely red, congested, and swollen, and the cuticle, which is greatly increased in quantity, flakes off in large masses. The desquamated cuticle is mixed with a certain amount of exudation-matter, which is, however, never sufficient to cause more than mere moisture. The disease occurs in debilitated persons, and is very liable to recur, and is, in fact, said to be ultimately fatal. The temperature is not, as a rule, elevated, but it may be, but probably only as an accidental manifestation in the course of the disease. The phenomena observed in this disease seem to point to some change in the sympathetic nervous system. When the case is progressing towards a cure, the cutis becomes less red and swollen, the desquamation diminishes, and finally the skin resumes its normal appearance. Sometimes, however, the disease becomes chronic.

TREATMENT.—The patient should be rubbed with oil and wrapped up in bandages soaked in oil to remove the scales and to keep the skin soft and supple. Internally, tonics and cod-liver oil are necessary. Arsenic is scarcely desirable, in fact a man came into University College Hospital, about three years ago, in whom an attack of *pityriasis rubra* came on while he was under the influence of arsenic for some small patches of psoriasis.

DIATHETIC DISEASES.

By this term we understand diseases that are dependent on certain persistent morbid dispositions of the body which modify to a greater or less extent all the nutritive processes. For the present we shall describe, very briefly, the syphilitic eruptions only.

Syphilitic skin eruptions vary according as the patient is the subject of hereditary or acquired syphilis.

Hereditary Syphilis.—The eruptions in this variety usually show themselves when the child is a month or six weeks old, but may be deferred for several months. In addition to the marasmus and other general symptoms of hereditary syphilis already described, the child becomes affected with mucous tubercles, condylomata, and fissures about

the mouth and anus, while dull erythematous rashes, which may or may not become tubercular, appear about the palms and the soles, but especially on the buttocks. Sometimes bullæ and pustules accompanied by deep ulceration appear, especially on the hands and feet. So-called syphilitic pemphigus is very frequently fatal in young children. But even in boys and girls and young adults, papular, pustular, and gummatus eruptions may show themselves as a result of hereditary syphilis.

Acquired Syphilis.—The actual nature of the eruption will vary according to the stage of the disease. The first cutaneous manifestation after the initial lesion is *roseola*, which occurs chiefly on the trunk, and consists of coppery, non-elevated spots, which leave behind dark stains or *maculæ* which may last for weeks. Next come the *papular syphilides*, in which there is a deposit of granulation-tissue. If the patches are still larger they are called *tubercular syphilides*, which frequently assume circular, serpiginous, or crescentic forms. About the same period the hair falls out, and often the nails become affected. *Vesicular syphilides* are rare, but are sometimes seen. *Rupia* is a bullous disease, and is always syphilitic. The bulla forms like that of pemphigus, but instead of the crust falling off it remains attached, while the ulceration extends under it and forms another layer. This goes on until several layers are formed, each one being larger than that above, hence the cockle shell-shaped crusts which are said to be characteristic of this disease. If the scab be removed a gray, sloughy-looking ulcer will be exposed. It should not, however, be forgotten that the typical rupia-crust may often be seen in cases where there is not the least evidence of a primary bullous stage. Exactly the same appearance may result from the ulceration of tubercular syphilides. In fact, it may be alleged that if rupia be regarded as essentially a bullous affection, it is very rare, whereas rupia-like ulcerations are very common in syphilis. The so-called *pustular syphilides* are usually due to the suppuration which takes place around the syphilitic deposit in the walls of the follicles in the disease known as *syphilitic acne*. The *squamous syphilides*, which have been called syphilitic psoriasis, differ from true psoriasis, inasmuch as the scaling in syphilis is the result of a deposit in the true skin, which disturbs the epidermic formation and really causes desquamation. It will be found, moreover, that the squamous syphilides rarely affect the seats of ordinary psoriasis. A squamous syphilide is very common on the palms and the soles, the desquamation always being preceded by a deposit of morbid tissue in the cutis. The particular seat of the syphilide will often be determined by some local irritation, the disease showing itself perhaps only on those parts of the hand or foot that are more pressed upon in work or in walking. In the later stages of syphilis, true *gummata* may be developed in and beneath the skin. These give rise to large, prominent, coppery, tubercular masses, which readily break down and ulcerate. It will, however, generally be found

that the amount of true skin destroyed by this ulceration is much less than had been anticipated, the ulceration really resulting from a destruction of the gummatous matter, the true tissue being removed rather by the pressure exerted by this deposit than by actual ulceration. Syphilitic skin eruptions are rarely attended with itching when fully developed, but it is not uncommon to find severe itching when the eruption is first appearing. All the eruptions are, moreover, followed by deep, dusky-red staining, which may remain for months or even years after all sign of deposit has disappeared. By observing the general characters of the eruption and paying attention to the history, there will be no difficulty in establishing a diagnosis.

TREATMENT.—The treatment of syphilitic skin affections must, to a large extent, be the same as that for the other manifestations of syphilis, but there are some differences which should be observed. Mercury should be always given in the early stages, and it is, as a rule, better to avoid iodide of potassium or the combinations of mercury and iodide of potassium which are so frequently prescribed. Good very rarely comes of such treatment, and it is not always free from harm. The next question is as to the form of mercury. It will be found that the milder and less stable preparations of mercury are most effectual for skin diseases. Chalk and mercury powder, calomel, or blue pill in small, frequently-repeated doses will be found to act better on the skin than the perchloride of mercury, which in the writer's experience has proved of little value. Two grains of chalk and mercury powder, with two or three grains of compound ipecacuanha powder, two or three times a day until the gums begin to become red, will be found a safe and trustworthy means of treating all of the earlier and many of the later syphilides. To eradicate the disease or to prevent relapse, the remedy must be persevered in from six months to two years, according to circumstances. To avoid the irritation of the gastric and intestinal mucous membranes, which sometimes occurs when patients have taken mercury internally for a long time, it will be well to omit the medicine for a day or two every two or three weeks, and to administer a saline purge to clear the bowels. So-called palmar psoriasis should always be treated with mercury, iodide of potassium being in the vast majority of cases quite useless even in the largest doses long continued.

It is very important in treating syphilis to combine tonics such as cod-liver oil, quinine, and iron, which will sometimes serve to dispel an eruption, or will at least greatly facilitate the action of the proper syphilitic remedies. In the later stages of syphilis more reliance may be placed on iodide of potassium, which may in fact be trusted to remove the gummatous deposits. It is well to combine ammonia and iron with the iodide of potassium. Locally, mercurial vapors, or inunctions will be found of great service. The sloughy-looking ulcers are best treated with the iodide of starch paste or iodoform, which cleanses the sores and facilitates the reparative action.

HYPERTROPHIES AND ATROPHIES.

In this class are included those diseases which are characterized by an increase or diminution in the size or in the quantity of the normal elements of the skin. This class is therefore a large one, but we shall consider only ichthyosis and its modified form xeroderma, elephantiasis arabum, keloid, and fibroma.

Ichthyosis and Xeroderma.—In these diseases the papillary layer of the skin and the epidermis are greatly hypertrophied, while the sebaceous follicles are small in size and few in number, so that the skin is not softened and lubricated by the fatty sebum. When there is a large accumulation of epidermis the disease is called *ichthyosis*, but when the skin is merely roughened, without any marked collection of the epidermis, it is called *xeroderma*.

The disease is characterized by a dry, roughened condition of the skin of the whole body, which is congenital, or comes on within the first or second year, and lasts throughout life. The patient is subject to eczematous eruptions in the flexures. When the skin is well protected and the weather mild there is very little annoyance, but if the skin be irritated, as in windy, damp weather, it cracks and desquamates, and becomes very tender and inflamed.

TREATMENT.—Although the disease is, strictly speaking, incurable, much may be done to relieve the patient's distress by oiling the skin and keeping it supple. No internal remedies are of any special avail. The skin is always best when the patient's health is good.

Under the head of hypertrophies should be placed *tylosis* or the callosity that arises from pressure, as on the hands of workmen and on the feet. *Clavus* or corn is a conical-shaped hypertrophy of the cuticle, the apex of which presses on the tender and generally atrophied cutis, and *verruca*, or wart, is a hypertrophy of the papillæ, covered by a thick layer of the cuticle. But these affections come more strictly under the care of the surgeon.

Of the same nature is the disease that has been termed *Elephantiasis Arabum*, which consists of enormous hypertrophy of the elements of the skin and of the subcutaneous cellular tissue. The disease seems to be due to some interference with the processes of absorption the result of inflammation of the lymphatics or veins. Erysipelas is not unfrequently the first phenomenon in the series of pathological changes that eventuate in elephantiasis. The lymphatics are irritated by the erysipelatous poison, become inflamed and obliterated. Solid œdema and hypertrophy of the elements of the skin soon follow, and the parts become hard, brawny, rough, and discolored, and very prone to ulcerate. In time the whole thickness of the tissues down to the bones may become involved. The disease is, however, rare in England, and is only amenable to surgical treatment.

Keloid consists of a localized hypertrophy of the fibrous tissue of the skin. The disease is *idiopathic* or *traumatic*. The *idiopathic* variety commences as a small, elevated, hardened mass, which is at first pale, but soon becomes pinkish and shining, and sends out offshoots like claws, which contract and produce great deformity. The most common seat is the sternum, but the disease is by no means confined to that part. The *traumatic* variety results from an unusually active growth of the cicatricial tissue closing a wound. It may therefore occur on any part of the skin that has been wounded, injured, or ulcerated; nor need the lesion have been severe. The appearance it presents is that of a slightly elevated, hard, and red tubercle, with or without processes, extending into the surrounding tissue.

TREATMENT.—Very little can be done; but some cases have been cured by pressure. Caustics and the knife are of doubtful value, because the disease is prone to recur in the scar of the wound.

Molluscum fibrosum or *fibroma* consists of sessile or pedunculated tumors formed by the circumscribed hypertrophy of all the elements of the skin. They are of the color of the true skin, and never contract as in keloid. When taken between the fingers the tumors have a peculiar soft feel, allowing of the inner surfaces of the two sides to glide over one another. They may occur on any part of the body except the palms and the soles, and may exist in great numbers. They do not cause any pain except when they become accidentally injured or inflamed.

TREATMENT.—Nothing short of surgical interference is of any avail.

Atrophy.—Loss of hair is one of the most important of the atrophic affections of the external integument, but this should be considered with diseases of the hair and hair-follicles. Sir James Paget has shown in his admirable lectures on Surgical Pathology that any constant pressure will cause atrophy, while intermittent pressure causes hypertrophy. In accordance with this pathological law, callosities of cuticle may occur as the result of intermittent pressure, but atrophy of the elements of the cutis will follow from the constant pressure of this hard, thick cuticle. In old age, too, the skin becomes atrophied, the fat is absorbed, the fibrous tissue becomes broken up and granular, the elastic fibres shrink or disappear, the follicles diminish in size and number, and the hairs fall out, so that the skin is thin, dry, harsh, inelastic, wrinkled and shrunken, and more or less bald.

NEW FORMATIONS.

Under this heading are included the heterogeneous neoplasms of the skin, which are cancer, lupus, and rodent ulcer. These diseases are all chronic, and the newly-formed tissue has a constant tendency to spread, ulcerate, and ultimately to destroy life. As cancer and rodent

ulcer are essentially surgical diseases, that is, always require surgical aid, we shall discuss only lupus, cases of which are more likely to come under the care of the physician.

Lupus.—This depends upon a deposit in the corium of what Virchow has termed “granulation-tissue,” the elements consisting of cells like those of the Malpighian layer of the skin. The granulation-tissue is found in every element of the skin, the rete Malpighii, papillæ, fibrous tissue, the walls of the follicles, and in the subcutaneous cellular tissue. The shape, size, and extent of the growth have given birth to names expressive of varieties, but in all cases the nature of the disease is the same. If the neoplasm do not ulcerate it is called *lupus non-exedens*, but if ulceration occur, *lupus exedens*. There is another variety which has been called *lupus erythematodes*, in which the disease begins in the walls of the sebaceous follicles and in the adjacent tissue. The disease then spreads superficially at the periphery while it heals in the centre. The patches are studded with white or greenish points of sebum, which project from the diseased follicles, but there is never deep ulceration. When the disease subsides, it leaves a thin shining cicatrix.

Lupus is rare before the tenth and after the thirtieth year, but is often seen early in life in scrofulous persons. The most common seat is the face, especially the nose and the cheeks, but it may occur on the buttocks, extremities, and, more rarely, on the trunk. The tissues most liable to become affected are the cartilaginous and the fibrous, and the mucous membranes. The disease commences as small, softish, red, and vascular nodules, which are not at all painful. In time the nodules increase in size and extent, and become covered with white scales of detached epidermis. After remaining for a varying period of time, the growth may undergo fatty degeneration, and become absorbed, leaving a superficial or depressed scar, according to the degree of deposit—*lupus non-exedens*; or the growth may spread and become extensively and deeply ulcerated, producing unsightly deformities, and even destroying whole organs—*lupus exedens*.

TREATMENT.—General tonics and good living. Cod-liver oil is very valuable in these cases, and often serves for a cure without any local applications. If the disease have ceased to spread and there be not much vascularity, small doses of iodide of potassium are useful, and assist in the absorption of the morbid tissue. Locally, if the parts be irritated, inflamed, and swollen, soothing applications, such as oxide of zinc and liquor plumbi should be used. A very useful application is oxide of zinc and starch-powder in the proportion of three drachms of the former to one ounce of the latter. Powdered French chalk may be used. These preparations are capable of taking up a large quantity of moisture, and therefore dry up and cause contraction of the swollen tissues.

Where the disease has ceased to spread, caustics may be applied to

destroy the growth. For this purpose the galvanic cautery is, perhaps, the best. After this come the actual cautery, acid nitrate of mercury, and arsenical paste. If caustics be applied too early there will be great risk of spreading the disease. Whenever there is a tendency to morbid growth, irritation of the tissues by any means whatever will stimulate them, and by that means increase the deposit.

PIGMENTARY CHANGES.

We shall describe but briefly the various pigmentary changes of the skin. They are simple and not attended with pain or discomfort beyond the annoyance they sometimes give to the delicate and sensitive feelings of ladies. All these affections are dependent on an increase in the quantity of the pigment of the skin. Sometimes the coloration is congenital, as in moles, but it is far more frequently acquired from irritation of the skin, or exposure to heat and sun. There are also what may be called pathological and physiological pigmentations of the skin, the former being seen in Addison's disease and certain cachexiæ, and the latter in pregnancy or even in women suffering from uterine affections. *Chloasma uterinum* is very common on the face of women, and rarely entirely disappears, although it becomes much fainter when gestation is over.

TREATMENT.—To remove the causes will often serve to cure the disease.

The neurotic affections of the skin may be omitted as belonging to the domain of the general physician and surgeon.

PARASITIC DISEASES.

This class includes all the effects produced by the various animal and vegetable parasites that may infest the human skin. We shall, therefore, have to describe first, the *dermatozoic* affections, and secondly, the *dermatophytic*.

The Dermatozoic.—In these diseases some animal parasite inhabits the skin and lives thereon. In describing the effects produced, it is well to distinguish between the *essential* and the *accidental* features of the malady. For instance, scabies is sometimes described as being a disease in which papules, vesicles, and pustules occur in certain situations, whereas the essential feature of the disease is the presence of the *acarus* in a *cuniculus*.

The skin diseases due to animal parasites are: 1. *Phtheiriasis*, (a) *pediculus capitis*; (b) *pediculus corporis*; (c) *pediculus pubis*. 2. *Scabies*, *acarus scabiei*. 3. *Morsus pulicis*, *cimicis*, or (d) *Folliculitis*, *acarus folliculorum*.

Phtheiriasis is the condition characterized by the presence of pediculi

on the body. At least three kinds of pediculi infest the human body, the *pediculus capitis*, the *pediculus corporis*, and the *pediculus pubis*, or crab-louse. It is not necessary to describe these well-known varieties.

The *pediculus capitis* inhabits the hairy scalp, and by the irritation it produces may give rise to impetigo with consequent enlargement of the glands of the neck. The *pediculus corporis* infests the trunk and clothes of persons, especially of those somewhat advanced in years. The real habitat of the *pediculus corporis* is the clothes, especially the seams and folds, so that the irritation of the skin will always be found worse on those parts of the body where the clothes press, as at the shoulders and the waist. The characteristic lesion is a small depressed hæmorrhagic spot, which is, however, *not* on the surface of the skin, but in the mouth of the follicle. This is produced by a small quantity of blood escaping into the follicle, when the pediculus draws its proboscis out of the follicle from which it has been sucking. As a secondary result of the irritation and scratching the follicles of the skin become much congested and swollen, little papules form, and the skin becomes more or less deeply pigmented; hence arises the disease known as *prurigo senilis*. The *pediculus pubis* is mostly found in the hair about the pubes, but may be met in other parts of the trunk, and even on the limbs and eyebrows, but not, as far as is known, on the head.

TREATMENT.—Mercurial lotions or ointments applied to the skin. A clean and effectual application consists of two grains of perchloride of mercury to an ounce of dilute acetic acid, which not only destroys the pediculi but dissolves the *nits* which are formed on the hairs. The clothes must be disinfected or the disease will recur.

In order to insure the destruction of the nits, the clothes should be heated up to at least 200° F. Many other applications, such as staphisagria, sabadilla, carbolic acid, chloroform, etc., are recommended for the destruction of pediculi.

Scabies, as we have just said, is a disease due to the presence of the *acarus scabiei* under the epidermis. The female insect bores obliquely through the upper layers of the epidermis, under which she deposits her eggs. She then tunnels her way under the epidermis, forming fine semicircular furrows or cuniculi, which she fills with eggs. The male, which is distinguished from the female by being smaller and possessing suckers on the posterior pair of the hind legs, does not make these little furrows. At the point where the insect rests a little vesicle may be seen, from which the cuniculus extends. As a result of scratching and irritation, papules, vesicles, and pustules form, and the skin becomes excoriated and disfigured with large ecthymatous pustules. There is considerable itching, which is worse when the patient is warm, especially in bed. The disease is most commonly seen in the delicate skin between the fingers and toes, and extends up the limbs, but chiefly on the flexor aspects. It occurs, also, on the penis, mamma, and even

on the face. In babies, it is most common on the buttocks, the acarus being transferred to the part from the hands of the nurse.

TREATMENT.—Sulphur-baths or sulphur inunctions, or styrax, will soon effect a cure, but care should be taken not to keep up the treatment too long lest eczema be induced.

The *dermatophytic* diseases are those characterized by the presence of vegetable fungi in or on the epidermis. They are *Tinea tonsurans*, *Tinea circinata*, *Tinea sycosis*, *Tinea kerion*, *Tinea versicolor*, *Tinea favosa*, and, according to some authorities, *Tinea decalvans*.

Tinea tonsurans is due to the growth upon the skin of the vegetable fungus called the *trichophyton*, which consists of oval transparent spores, many of which are isolated, while others unite and constitute jointed filaments. The fungus inhabits the hairs and their sheath, and the epidermis of the scalp and other parts of the body. When the hairs are affected they swell up, become paler in color and opaque, and lose their elasticity, breaking off close to the surface of the skin. The hair splits up, and the cortical portion and even the cylinder are found full of sporules and mycelia. The effects of the fungus vary according as it occurs on the body, or on either beard or scalp.

1st. *Tinea circinata*, or ringworm on the body, commences as a small, circular, pale, elevated spot, of the size of a split pea or larger, which is covered with fine scales, and is attended by great itching. As the spot increases in size the centre clears, and the patch becomes a ring, which may extend till it attains a diameter of three or four or more inches. It may occur on any part of the body, but is more common in those parts which are more freely exposed to the contact of the fungus, as the face, neck, back of hands, wrist.

2d. *Tinea sycosis*, or ringworm of the beard, begins as *Tinea circinata*, but soon the fungus invades the hair and the hair-follicles. The hairs break off short, and are filled with fungus, while the adjacent tissue becomes swollen and indurated. This disease is very rare in England, very few unequivocal cases having been recorded.

3d. *Tinea tonsurans*, or ringworm of the head, is met with chiefly in children. The disease begins as little rounded patches of various sizes, from which the hairs break off, and which are covered by a furfuraceous scaliness. The patches therefore are studded with short stumps of pale hairs, which are split and frayed out.

If by any means the patch of ringworm becomes inflamed, the tissue surrounding the hair becomes swollen and granular, the hairs fall out and the follicles pour out a viscid secretion. This is what has been called *Tinea kerion*.

4th. *Tinea versicolor*, or *chloasma*, as it is sometimes incorrectly called, is the peculiar fawn-colored furfuraceous scaliness of the skin, which is due to the presence of the fungus, known as the *Microsporon*

furfur, which consist of fine curved branched filaments, and large collections of conidia.

The favorite seat of the fungus is the front of the chest, but it may extend to other parts of the body. It is especially common in phthisical persons, and is undoubtedly contagious.

5th. *Tinea favosa* is seldom seen in England, and occurs mostly in young ill-nourished children. This disease is characterized by the presence of yellow cup-shaped crusts, which may be separate or united into large masses. The fungus of which the scabs are composed is the *Achorion Schönleini*. The disease begins in the inner root-sheath of the hair-follicle, from which it spreads, and is usually accompanied by deep ulceration of the skin. Under the microscope the fungus consists, for the most part, of little rounded or oval bodies of about $\frac{1}{3000}$ th of an inch in diameter, and of tubes, branched, empty, and granular, simple and jointed.

The crusts possess a peculiar odor, which has been compared to the smell of the urine of a cat, or of a cage in which mice have been kept. Although the hairy scalp is the most frequent seat of the disease, it may occur on other parts of the body, as the face, arm, and neck.

6th. *Tinea Decalvans*.—The disease commonly known by this name, but more correctly called *Alopecia areata*, has for long been regarded as a parasitic disease, due to the *Microsporon Audouini*, but the evidence of its parasitic nature is entirely wanting, the best observers having failed to find any plant. The disease consists of smooth, shining, bald patches on the scalp. The roots of the hairs are atrophied, and the hairs readily fall out. The alopecia appears to be due to a mal-nutrition of the skin of certain parts. Generally the hairs grow again. Numerous cases have been recorded to show the contagious nature of this disease, but no one has ever satisfactorily demonstrated the fungus, and it is certain that in the majority of the cases designated *tinea decalvans*, no fungus can be found. It is possible, however, that two diseases have been confounded, one in which fungus does exist, and another which is more common, in which the disease consists of atrophy of the root of the hairs from some want of nutrition.

TREATMENT.—To treat dermatophytic diseases, we should pluck out the diseased hairs, and clean the patches by rubbing in soft soap, and then apply some parasiticide, as equal parts of sulphurous acid and glycerin, or one part of carbolic acid to three, four, or even ten parts of glycerin. The perchloride of mercury lotion recommended for pediculi is useful. When the patches are inflamed, soothing applications are best. In *tinea decalvans* rubefacients are necessary. I prefer the application of mustard-leaves or poultices, or the continuous current.

AFFECTIONS OF THE GLANDS.

We may now briefly consider the functional and structural affections of the glands of the skin. In many cases both the sebaceous and sudoriparous glands are simultaneously affected, as a result of some alteration in the relation existing between the blood and the excretory apparatus. At other times the causes are purely local.

Sweat Glands.—The secretion of the sudoriparous glands may be altered in quantity and quality. Excessive sweating is called *hyperidrosis*; diminished sweating *anidrosis*. If the mouth of the follicle is closed when the sweating is in excess, the acid liquid collects and distends the follicle, and gives rise to clear, pearly vesicles, known as *sudamina*, or *miliaria alba*. If the follicle be at the same time inflamed, the fluid will be less clear and alkaline, and there will be a halo of redness round the follicle; this is known as *miliaria rubra*. Sometimes the color of the sweat is altered to yellow or black, etc., but it must be confessed that the majority of these cases are probably impositions.

Sebaceous Glands.—Sometimes the excretion of sebum becomes excessive, and it collects on the surface of the skin. If there be much stearin, or margarin, the sebum will collect in flakes and crusts, but if there be an excess of olein, the skin will appear greasy. Both these forms of *seborrhœa* are common on the scalp, especially in babies. The skin often becomes tender and inflamed under the cakes of sebaceous matter, and eczema is set up.

When from any cause the secretion of the glands does not escape, but remains in the ducts, a little point, which soon becomes black, is seen on the surface of the skin, at the mouth of the follicle, and a *comedo* is said to exist. If this retained excretion irritate the wall and set up a slight amount of inflammatory redness, *acne punctata* is produced. But if, in addition to the redness, there is a considerable amount of inflammatory exudation and new growth forming hard masses, we have *acne indurata*, and when the points suppurate, *acne pustulosa*. When the acne nodules are accompanied by great vascularity from varicosity of the adjacent venules, and by a great increase of the surrounding connective tissue, it is called *acne rosacea*.

Acne is most common at the time of puberty, and seems to have some connection with the development of the sexual organs, but some, and especially those outside the profession, have made too much of this, and cruelly regard those suffering from acne as the subjects of self-abuse. This is an opinion that should be warmly combated as calculated to ruin many a good name. In young adults the disease is often met with associated with dyspepsia and derangement of the organs of generation, or as a result of exposure to heat, or from want of proper cleanliness.

The favorite seats are the face, back, and shoulders, where the sebaceous glands are largest and most active.

TREATMENT.—Improve the general health; treat symptoms as they occur; evacuate the follicles by frictions or pressure, and stimulating applications. Sulphur ointment and soft soap are useful locally, and the application of a weak solution of perchloride of mercury (p. 894) is often followed by good results.

Molluscum Contagiosum.—In this disease there are numerous small pedunculated or sessile tumors on the skin, varying in size from a pin's head to a large pea, or even a bean. On the summit of each may be seen the depressed aperture of the follicle, the disease being due to an enormous hypertrophy of the sebaceous glands, and not merely to retention of secretion. The contagiousness of this disease has been denied by some, but it must be allowed that in some instances there is unequivocal evidence of contagion. The writer has met with a case in which the trunk and lower extremities became covered with hundreds of these tumors, as the result of contagion from sexual intercourse with a woman who had some of these molluscos tumors on the thigh.

TREATMENT.—When recent, the glands may be readily squeezed out bodily, and the disease thereby cured; but if growths have existed some time they require more force to bring them away, and then they often crumble under pressure. Some writers recommend the application of nitrate of silver to the wall of the gland after the contents have been evacuated, but this is rarely necessary.

Sycosis consists of an inflammation of the hair-follicles and sebaceous glands. The disease seems to commence in the follicle or in the tissue outside, and to implicate gradually the glands. There is considerable redness, swelling, and suppuration, and if the disease be neglected the glands will ulcerate out and leave a thin, shining cicatrix, on which the hairs never grow again. The causes are various. Irritation of any kind, as shaving with a dull razor, or the application of irritative washes, may produce it. The disease is remarkably obstinate, and may last for years.

TREATMENT.—The hair should be cut close and epilated early, and, if suppuration have taken place, small scarifications should be made. By epilation the disease may at once be cured, or at the least greatly checked; and it is vain to hope for any good effects so long as the hairs remain to keep up the irritation. Tonics and arsenic in some form will also be found useful in the later stages.

Xanthelasma or *Vitiligoidea* is due to an alteration of the epithelium lining the sebaceous follicles, accompanied by a fatty infiltration, and the deposit of a light-colored pigment. It occurs in two forms, the *plane* and the *tuberosus*, and presents itself in little yellow patches, especially about the upper eyelids, but it may be found on any part of

the face, limbs, and palms. It is said never to occur in children, but a case was lately seen at University College Hospital, in which acute general xanthelasma had shown itself in a young child one year old. Frequently, but by no means always, the disease is associated with some affection of the liver.

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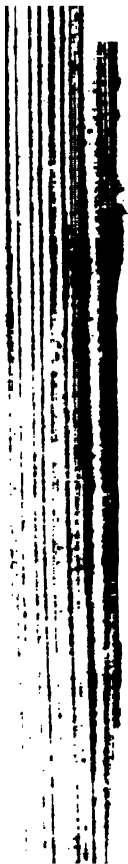
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